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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. NOVEMBER 9, 1899. CHICAGO, ILL. NUMBER 45

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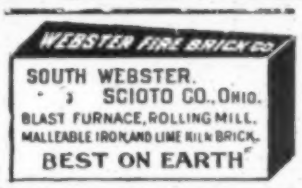

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. NOVEMBER 9, 1899. CHICAGO, ILL. NUMBER 45

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron market shows a continuance of the conditions of the past few weeks—a very firm maintenance of the high prices for pig iron and steel, with a tendency upward rather than downward, while in some finished material lines there is an effort to get down gracefully and without serious dislocation, from the famine basis of the summer months. The trade has paid little attention to politics in the midst of a campaign that in some quarters was heated. Now that the elections are over, the result furnishes no reason for any change in business policy. Though mixed, as all State election results are, the verdict on National questions, where they were permitted to become a factor, is not such as to make capital timid or cause apprehension for the outcome of the Presidential contest. The iron trade is approaching the end of the year with its judgment well made up as to the basis that will obtain generally in the first half of the year for pig iron and semi-finished material. It is practically assured also that in all finished material lines there will be a strong market, but here some uncertainties exist as to the precise figures that will rule. The evidences that the mills can make deliveries more promptly are influencing buyers' decisions, and for some little time orders are likely to keep closer step with mill output, and the making of long-time contracts will be deferred. Plate mills are some distance apart in their ideas of price. The same condition appeared recently in bars in Central Western territory; but the advance of $2 by Eastern bar mills, and the decision of Western manufacturers of steel bars in their Pittsburg meeting, concerning extras, indicate the postponement of any material change in price. The passing of Nov. 1 without the exercise of options on sheet mills means the failure of the consolidation enterprise and there is no immediate indication that the effort will be renewed. This has accented the weakness in sheets that for some time has been in contrast with conditions in other finished lines. In general, bar, plate and structural mills are so well supplied with contracts that the waiting time just ahead may pass without any material lowering of prices; and should the demand in the spring develop strongly, the basis of the past summer might be duplicated in the busy season of next year. Meantime both buyer and seller seem likely to work through the winter without further committals to heavy contracts. In pig iron the developments of the past week have been on the side of strength. In the East the pressure of insufficient cars to supply the furnaces with coke has been felt. And in connection with the negotiations for furnace coke for next year, it appears that some would-be buyers are not able to make contracts as yet, because producers are not sure that there will be a surplus after the wants of old-time customes are supplied. There is still in evidence what we have commented on from the beginning of the movement to get additional furnaces into blast—a failure both of equipment manufacturers and of producers of raw material to respond to the plans of furnace owners and builders for the increase of output. Eastern sellers of pig iron are naming higher prices. In the Chicago district considerable sales have been made to car works, including a round lot to the American Car & Foundry Co., and car wheel foundries have been in the market. Chicago notes also sales of 7,000 tons of structural material to works carrying stocks, with a construction contract about closed calling for 7,000 to 10,000 tons more. The price of Lake Superior Bessemer ores, it now seems likely, will be higher than has been named in this column, some strong interests favoring a base of $5.50, as against $2.95 this year.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
705 PUBLICATION BUILDING, Nov. 8.

The iron and steel market has been rather uneventful in the week under review. There is no pressure to sell as mills are well sold up and welcome a breathing spell rather than otherwise. The demand in finished lines is being supplied mainly by mills which have less confidence in the prospect of higher prices than have others. There are quite a number of small inquiries in the market for Bessemer iron, which altogether foot up a round tonnage, but the furnaces are practically altogether sold up to July 1 next, and little business has resulted. In steel there has been some tonnage disposed of, but buyer and seller have not gotten close together yet. In finished lines there has been a fair running demand, and this has been supplied at practically former prices.

The outlook for a good demand next season continues promising and producers feel that as the season approaches prices will advance rather than recede. There is no prospect of lower prices for pig iron, and present prices for finished material for next year's delivery are not out of keeping with the price of raw material. The bulk of the furnace coke production for next year has been sold all the way from $2.75 to $3, and there is every reason to believe that ore prices will be fixed on a comparatively very high level.

PIG IRON.—There has been a decided lull since the heavy sales of iron in the past few weeks. The output of the Bessemer furnaces is well sold up to the middle of next year, and some third quarter iron has been sold. Nothing has been done lately below $23.50, Valley furnace, and as the rate on pig iron from the Valleys to Pittsburg will be 90 cents on and after Jan. 1 this means $24.40, Pittsburg, for Bessemer iron for next year. For delivery this month some small odd lots of Bessemer iron have sold as high as $25 and $25.50, Pittsburg. In foundry and mill iron there has been no change in prices, and furnaces are well sold up. We quote the market as follows for delivery beyond Jan. 1:

Bessemer, valley furnace	$23.50
Bessemer, Pittsburg	24.40
No. 1 Foundry	24.00 to 24.50
No. 2 Foundry	23.25 to 23.50
No. 3 Foundry	22.50 to 23.00
Gray Forge, valley furnace	20.50 to 21.00
Gray Forge, Pittsburg	21.00 to 21.50

STEEL.—There has been a fair tonnage of steel billets sold for next year's delivery, at from $36 to $37. For this year's delivery prices are considerably higher, and a few small lots have been sold around $40, but the tonnage has naturally been very limited. The steel mills are catching up in deliveries to a certain extent, but are still shipping considerable very cheap steel. Some of the large steel producers have

not covered for all the extra iron they will require for the first half of next year, and it is freely predicted that when the time comes they will not be able to run to their full capacity. Basic open-hearth steel continues strong at $50.

FERRO-MANGANESE.—This metal continues very strong, and the minimum price is $100 for large lots, with only the producer in this district well sold up. Small lots have brought as high as $125.

RAILS AND TRACK MATERIAL.—There has been no important change in the rail situation. A number of railroads have been buying track material to go with the rails recently purchased for 1900 delivery, and the market is very strong with higher prices for links and pins and track bolts. Some roads are deferring their purchases until later. Makers generally are well filled with orders. We quote rails and track material as follows: Rails, standard sections, over 200 tons, $35; 100 to 200 tons, $37; car lots, $38; less than car lots, $40; light rails, 25 pound, and less than 50 pound, $37, all f. o. b. mill, Pittsburg; track material—Spikes, 2.50c; track bolts, square heads, 3.60c; hexagon heads, 3.85c; splice bars, 2.50c to 2.60c; links and pins, 3c to .10c.

BARS.—The market for both steel and iron bars continues fairly active, but with prices as irregular as formerly. The Western bar iron manufacturers at their meeting in Pittsburg last week decided to make some changes in the list of extras and these are now being formulated by the committee having the matter in charge. The new list will probably be out next Monday, and will go into effect at once. The principal change is in doing away with the separate list on bands and classing them as extras in the bar list. By this means it will not be necessary hereafter to quote one price on bars and another on bands. Another change is the putting of extras on large sections of bars which from their shape are not economical to roll. We quote steel bars at 2.20c to 2.25c, Pittsburg, full half extras, and iron bars from all muck stock at a shade higher. For delivery this year steel bars continue to bring a substantial premium, and 2.50c and even higher has been paid.

STRUCTURAL MATERIAL.—Structural material continues in very good demand for the season. It is not probable that any change in prices will be discussed until some time in the new year, after a fair tonnage has been placed for summer delivery, when the situation can be better sized up. We continue to quote former prices, as follows: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees 2.30c; zees, 2.25c; angles, 2.25c. Universal mill plates are quoted at 2.75c to 2.90c.

PLATES.—The plate market is fairly active, and prices continue at about the former level, some manufacturers still keeping out by quoting higher prices than those at which the bulk of the business is being done. For delivery this year tank plate cannot be had under 2.70c to 2.75c, while for delivery next year we quote: Tank, 2.50c to 2.60c; shell, 2.60c to 2.70c; flange, 2.70c to 2.80c; fire box, 3¼c to 4c.

PIPES AND TUBES.—Prices are unchanged, except for well casing, these being advanced, taking effect last Monday, from 40 to 37½ per cent off for screw and socket joints and from 35 to 32½ per cent off for inserted joint. The demand continues very good, but mills are now able to make reasonably prompt delivery. We quote prices as follows: Merchant pipe, 50 and two 10's for carloads delivered within the specified territory; well casing, screw and socket joint, 37½; inserted joint, 32½, with an optional 5 per cent to dealers only; boiler tubes 1¼-inch to 1½-inch, 40 per cent off; 1¾-inch to 2½-inch, 50 per cent off for iron, and 55 per cent off for steel; 2¾-inch and larger, 52½ per cent off for iron and 55 per cent off for steel, with 5 per cent additional in carloads, less than carloads being f. o. b. mill.

SHEETS.—It is understood that the options on the sheet mills, which expired the end of October, have not been renewed, and the project is now dropped. The market has been rather weak, some of the mills being anxious for tonnage, although others are very strong in their demands. We quote No. 28 gauge, one pass through cold rolls, at 3.10c to 3.15c, but it should be noted that some mills are asking as high as 3.25c. We quote galvanized at 70 and 10 off, with a 15-cent freight allowance, but a firm offer for a desirable lot would probably bring out a slightly lower quotation.

SPELTER.—The new schedule of zinc ore prices put 60 per cent zinc ore in the bin at $40 instead of $43, the old rate, at which, however, only a limited tonnage was sold, some sales having been made as low as $40. Spelter continues to grow weaker, and prime Western grades can now be easily had at 5c, Pittsburg, for spot shipment, while December delivery can be secured at 4.85c, or 4.90c.

OLD MATERIAL.—The maket for old material continues very irregular. Dealers find themselves largely at the mercy of the large buyers, who are not now in the market, and while it is held that nearly all lines of scrap are very scarce, there is not enough demand to put prices to the level that dealers think should be maintained. We quote prices as follows: Pittsburg, gross tons, except where otherwise specified: Steel rails, mixed lengths, $20 to $22; short lengths, $22 to $24; iron rails, $30 to $32; cast borings, $12 to $13, net tons; cast scrap, $18 to $19; No. 1 wrought scrap, $21 to $22, net tons; bushelling scrap, $16 to $17, net tons.

COKE.—Despite the car shortage which was very pronounced in October, the month of 26 working days saw shipments aggregating 35,216 cars. Had sufficient cars been available the shipments would easily have reached 40,000 cars. The outlook today is not good and cars have been quite scarce so far this month. The bulk of the tonnage of strictly Connellsville furnace coke for next year has been sold at prices ranging from $2.75 to $3, at which we quote the market with foundry coke at $3. Crushed coke is very scarce, and new orders are only accepted with reluctance, as producers are behind in shipments.

CHICAGO.

Office of The Iron Trade Review,
1522 MONADNOCK BLOCK, Nov. 8.

The most important event of the week was the burning of the great plant of the American Steel & Wire Co., at Waukegan, Ill. This will cause considerable inconvenience to its owners, but does not delay the filling of orders to any extent, and does not influence the general market. The situation locally is about as it was a week ago. The demand for nearly all kinds of iron and steel products continues large, and sales last week were of considerable size. Great trouble is experienced by mills and furnaces in securing cars, and in many cases this has caused considerable trouble to consumers.

PIG IRON.—The American Car & Foundry Co. is reported to have purchased 30,000 tons of pig iron in the past week, about equally divided between coke iron and charcoal iron. A large car wheel concern has purchased 10,000 tons of iron, and several other buyers have bought considerable quantities. The small-lot business has also been of large proportions, making the aggregate for the week considerably better than that of the week previous. The demand is excellent, and gives every indication of continuing. Furnaces that can make prompt deliveries are few and far between, and find no difficulty in disposing of whatever iron they may have to sell. While nearly all of the buying so far has been for delivery previous to the middle of next year, some buyers have come into the market for their entire year's supply, and have placed orders or will do so in the near future. As a general thing, however, furnaces do not expect much iron will be sold for delivery in the last half of 1900 until in the spring of the year. There have been no changes in prices in the week, but the situation is very strong, and it is more than likely that both Northern and Southern prices will be marked up within a short time. Quotations are made as follows

Lake Sup. Charcoal	$25 50 @ $26 50	Southern Coke No. 3	$20 85 @ $21 85
Local Coke Fdy. No. 1	24 00 @ 25 00	Southern No. 1 Soft	22 85 @ 23 85
Local Coke Fdy. No. 2	23 50 @ 24 00	Southern No. 2 Soft	21 85 @ 22 85
Local Coke Fdy. No. 3	23 00 @ 23 50	Southern Silveries	26 50 @ 27 00
Local Scotch Fdy. No. 1	24 00 @ 25 00	Jackson Co. Silveries	32 00 @ 32 50
Local Scotch Fdy. No. 2	23 50 @ 24 00	Ohio Strong Softeners	24 50 @ 25 00
Local Scotch Fdy. No. 3	23 00 @ 23 50	Alabama Car Wheel	24 00 @ 26 00
Southern Coke No. 1	22 85 @ 23 85	Malleable Bessemer	23 50 @ 25 00
Southern Coke No. 2	21 85 @ 22 85	Coke Bessemer	25 00 @ 26 00

BARS—The demand for iron and steel is of large proportions, and the week's sales were considerably in excess of those of the week previous. Several orders for 1,000 tons or more were placed in the week. The market is very firm, although no advances have been made. A meeting of the bar mills was held in Pittsburg last week, but nothing was done regarding prices, and the market was left open. Quotations are made at 2.35c to 2.50c for both steel and iron bars, half extras.

CAR MATERIAL.—There is a large demand for car material

of all kinds, and some difficulty is experienced in placing orders. Car orders in the week were of good size, but included no notable contracts. The car works are full of business, and could get many more orders could they take the business for the deliveries required.

STRUCTURAL MATERIAL.—Stock orders for about 7,000 tons of bridge material were given out last week by two of the bridge concerns in this market. General business in small lots was excellent, and made a large aggregate. No notable contracts were closed in the week, but an inquiry has been received for bridge work calling for from 7,000 to 10,000 tons. The contract for this will be placed in a short time. The market is very firm. Quotations are unchanged as follows: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches and over six inches, 2.50c; three inches to six inches, 2.40c; sheared plates, 3.15c to 3.25c; universal plates, 3.15c to 3.25c; tees 2.45c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

PLATES.—The plate market is hardly as strong as other branches, and prices are not so steady. It is said that some mills are out for business, and have made quotations quite a little under the prices we give. The demand is good, and sales from store were especially gratifying last week. Mill business was not so large. The local mills are not pushing for business, they say. Prices are made as follows: Tank steel from store, 3.40c to 3.50c. Mill shipments, Chicago delivery: Tank steel, 3.15c; shell, 3.35c; flange, 3.35c; marine 3.40c; fire box, 4c to 6c, according to brand.

MERCHANT PIPE.—The demand continues good, and quite large sales were made last week. Prices are unchanged at 50 and two 10's off for mill shipment on large orders, and 50 and 10 and 5 off on small orders.

SHEETS.—The market is not especially strong, and some mills are making prices quite a little under the prevailing schedule. The demand is not large, although several quite good contracts were closed last week. No. 27 black sheets are quoted at 3.15c to 3.40c, and galvanized at from 70 and 10 to 70 and 10 and 5 per cent off.

MERCHANT STEEL.—The demand is a little better, and several good contracts were closed last week, the aggregate for the week being very satisfactory. The market is strong and unchanged. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel, 3.65c to 3.75c; tool steel, 7c to 7.50c; special, 13.50c and upwards.

BILLETS AND RODS.—There is no change in the situation. The local mills have made no sales and are not quoting.

RAILS AND TRACK SUPPLIES.—Sales of standard sections last week aggregated about 7,000 tons, and quite a little more business, in small lots, is in sight. The demand for light rails is of good proportion also. Quotations are as follows: Rails, standard sections, $35 to $38; light sections, $37 to $42; splice bars, 2.50c to 2.70c; spikes, 2 75c to 2.85c; track bolts, 3.65c to 3.85c.

WIRE AND WIRE NAILS.—The American Steel & Wire Co. states that the burning of its plant at Waukegan will not interfere materially with its shipments, as all orders will be filled from stock or from other mills. Until the plant is rebuilt, of course, the capacity of the company will be that much smaller. General business was large in the week, orders for nails being especially good. The demand gives evidence of increasing. Prices are still unchanged, but rumors of advances continue to be heard. Makers quote single carloads of wire nails at $3.25, f. o. b. Chicago, and $3.35 for less than carloads. On wire current quotations are as follows: Plain annealed wire, $3.10; painted barb wire, $3.70; galvanized barb wire, $3.85.

OLD MATERIAL.—There is no chang in the situation. General business is of fair proportions, but no large sales were made last week. Dealers are looking for considerably higher prices within the next month, and affirm that there is more than likely to be a considerable shortage of mill grades of scrap. Dealers' selling prices are revised as follows:

Old iron rails, gross,	$32 00@$33 00	Country malleable	$15 00@$16 00
Old steel rails, long, gr.	24 00@ 25 00	Iron axles, net	32 00@33 00
Old steel rails, mixed	20 00@ 21 00	Cast borings, net	10 00@11 00
Relaying rails, good	30 00@ 31 00	Wrought turnings, net	14 00@14 50
Old wheels, gross	22 00@ 22 50	Iron axle turnings, net	16 00@16 50
Railroad forge, net	26 00@ 27 00	Steel axle trimmings	15 00
Dealer's forge, net	19 00@ 21 00	Mixed steel, gross	17 00@19 00
No. 1 cut mill, net	16 00@ 17 00	Stove plates, net	11 50@12 00
Heavy cast, net	16 00@ 17 00	Heavy melting steel, gr	20 00@21 00
Railway malleable, net	17 00	Old iron splice b., net	27 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
27 VINCENT ST., Nov 8.

The movement of iron ore is surprisingly large, and the total for the season is likely to revise all estimates. The October shipments, contrary to all precedent, exceeded those for September, being 2,543,859 gross tons, against 2,369,306 tons in September. The season's total to Nov. 1 was 15,560,078 gross tons, against 12 545,566 tons to Nov. 1, 1898, or an increase of 3,014,512 tons over last year. In October, 1898, the movement was 1,551,000 tons; this year it was about 1,000,000 tons greater. There seems no reason now, if the rate of the first week of this month is kept up for a fortnight more, why the water shipments should not reach 17,000,000 tons. When it is considered that the season opened exceptionally late, there is very little support in these figures for any view based on an insufficiency of tonnage to care for the lake traffic of 1900. It is known that in addition to new vessels that have been in commission for only a portion of this season, there are under construction or ordered for 1900 boats equal to the hauling of 3,000,000 tons of ore in a season. Additional docks are being built at certain upper lake ports. A comprehensive program for increasing ore handling and ore storing facilities at lower lake docks and at furnace yards is under way. Large additions in the shape of 40-ton and 50-ton cars and new and heavier locomotives are being made by railroads running to Lake Erie ore docks. All these are practically an augmentation to vessel capacity because they mean better dispatch and more trips in the season. If 17,000,000 tons can be carried in a season like the present, the indications are that next year's available ore-carrying capacity will be not a little in excess of the ore to be carried, unless more blast furnaces can be provided for the consumption of Lake Superior ores. Statistics indicate a present consumption at the rate of 16,500,000 to 17,000,000 tons a year. There were 2,073,000 tons on dock last May. Here and there furnacemen are reported whose purchases will carry them into July, 1900, or further. They will not buy such an amount of ore next year as they took last spring at the low prices.

As to the price that will be paid for old-range Bessemer ores for next year, there is yet nothing decisive. Influential interests are reported to be favoring a strong advance. We have mentioned $1.50 and $2, but $2.50 is more likely now; this would give a $5.50 base, as against $2.95 this year. There have been delays in getting a conference of the ore men; and it may be postponed now for a fortnight. Sales of non-Bessemer ores for 1900 now appear to be confined to those already mentioned, whhic were at an advance of about $2 over the 1899 basis.

PIG IRON.—It has been a quiet week. After the large purchases of the wire interest, as noted last week, the Bessemer market is without feature. Some small inquiries are up, and the minimum quotation is now $23.50 at Valley furnace. Since the furnaces have little iron to sell for the second quarter of 1900 and none for the first quarter, unless records are made in excess of calculations, there will be an uneventful market for some weeks. Sellers of foundry iron have had some calls for help from disappointed customers who have had to change their mixtures, but very little iron is available for such emergencies. There is occasional buying by foundries for next year, but there will probably be a wait before another marked buying movement. We continue quotations on all grades of iron:

Bessemer	$24 00	Valley Scotch No. 1	$23 00@23 50
No. 1 Strong Foundry	23 00@23 50	Valley Scotch No. 2	22 50@23 50
No. 2 Strong Foundry	22 50@23 00	Gray Forge, valley	21 00@21 50
No. 3 Foundry	21 50@22 00	Lake Superior Charcoal	25 00@26 00

FINISHED MATERIAL.—Variations in the quoted prices of different sellers are still a feature; particularly is this noticeable in plates. Tank plates for delivery in the early months of next year have sold at 2.70c to 2.75c, Pittsburg mill; yet there are quotations as high as 3c. Boiler steel shows nearly the same range, but in general is sold between 2.80 and 3c at mill. All plate mills are better able to take care of business and the increased plate capacity is having its natural effect. In bars there is wanting the urgent demand upon stocks that led to the paying of the high prices of the late summer and early fall months. The mill quotation for steel is about 2.25c, though some sellers quote as high as 2.40c on business

in the first quarter of next year. The ability of some producers to make prompt deliveries from mill has tended to ease prices, and there is at the moment no disposition to buy heavily for the later requirements. We continue the quotation of 2.15c at valley mill for common iron bars. The sheet market has been even weaker since the announcement of the expiration of options on mills to the promoters of the consolidation. Reasonably prompt deliveries can be made from mill, and we quote 3.10c to 3.15c, Pittsburg, for No. 28 black. In galvanized 70, 10 and 5 is quoted on larger lots. There is still a good demand for structural material and purchases for the considerable stocks now carried by fitting works are being made. Angles, particularly of unequal legs and larger widths, used in shipyard work, are very difficult to get. In the smallest sizes the same trouble exists, and in some cases mills are filled up for four or five months. The local demand for wrought pipe is only moderate but prices are very firm.

WIRE AND WIRE NAILS.—Increased activity is noted at Central Western wire plants in consequence of the fire at Waukegan. The demand is well maintained. We quote Pittsburg mill prices to jobbers in carload lots as follows: Wire nails, $2.95; smooth wire, $2.80; painted barb wire, $3.40; galvanized, $3.55.

OLD MATERIAL.—The leading consumer of iron scrap is evidently well supplied with material, but dealers are taking all available lots and are holding prices very firmly. We quote old iron rails at $30; old steel rails at $21 to $22; old car wheels, $22, all gross tons. No. 1 railroad wrought is $24 to $25; mill scrap, $17; machinery cast scrap, $17; iron axles, $28; axle turnings, $16; wrought turnings, $13; cast borings, $11—net tons.

CINCINNATI.

Nov. 7.

The past week has been an active one and some large sales have been booked. The demand has been for all classes of iron, deliveries almost wholly for next year. One large order was for the latter half of 1900. The tendency seems to be toward higher prices for pig iron. Rogers, Brown & Co. refer as follows to the conditions as they have been developing of late: "The scarcity of pig iron is felt more and more each month and will continue to be felt until an adequate supply can be provided. That provision is being made very tediously, and there is no reason to believe the output for 1900 will exceed 15,000,000 tons. The prices prevailing are regarded by some as unstable, but when it is known that many furnaces are sold out until July next year, and that nearly all the remainder are sold up for three, four and five months in the future, the indications favor the maintenance at least of prices current. Many consumers whose pig iron contracts expire with the year, have yet to provide for their future requirements and a large number of consumers find their present orders insufficient for work on hand and are supplementing, so that the demand continues as heavy as at any time, perhaps, since the revival began, and there are evidences that there will be no abatement, as the demand is natural and legitimate. The professional speculators have not been in the market during all this industrial renaissance, except to dispose of all their holdings."

From Matthew Addy & Co.'s review of the past week we take the following: "The week in this market has not been productive of anything phenomenal. There has been no one transaction of great magnitude, but there have been minor transactions in good number, so that the aggregate tonnage has been entirely satisfactory. Anything for quick shipment is sold as soon as it is offered. The particular feature of the present situation seems to be the buying movement among the smaller foundries. The larger concerns have from time to time purchased heavily for next year. Some of them are still uncovered, but the majority of the wholesale consumers are fairly well covered for at least the first half of 1900. Many of the lesser concerns have been taking chances on the market. Their contracts for pig iron will expire some time about the first of the year, and they are now beginning to look ahead and are consequently in the market some of them for iron from January to July, and others for later deliveries. A buying movement on the part of the smaller foundries is very significant, and while the orders placed from day to day may not seem large, yet they count up very rapidly. This kind of a movement is now gaining headway and it promises to increase steadily in volume. Complaints on account of delayed shipments from consumers and complaints from the furnaces of lack of cars are numerous and exasperating."

We quote as follows for cash f. o. b. Cincinnati: Southern coke No. 1 foundry $21.75 to $22.25; Southern coke No. 2 foundry, $20.75 to $21.25; No. 3 foundry, $19.75 to $20.25; No. 4 and gray forge $19.25 to $19.75; No. 1 soft, $21.75 to $22.25; No. 2 soft, $20.75 to $21.25; Lake Superior coke, No. 1, $24 to $24.50; No. 2, $23 to $23.50; Hanging Rock charcoal, No. 1, $25 to $26; Jackson Co. silvery, No. 1, $30 to $31; standard Georgia car wheel, $23.75 to $24.75; Lake Superior charcoal, $25 to $25.50.

PHILADELPHIA.

Nov. 7.

The situation is unquestionably stronger so far as pig iron is concerned. Some of the Eastern furnaces have made advances in the past ten days and others have withdrawn from the market. Sales of No. 1X foundry have been made above $25 and of No. 2X above $24. We quote No. 1 at $25.10, f. o. b. Philadelphia, No. 2 at $24.10. There are indications of higher figures before the close of the year. We quote mill iron at $20 to $20.50. The car famine is still felt. Coke producers cannot take care of the furnace trade promptly, and what with bankings on this account, the furnaces are unable to catch up on deliveries, which have been unsatisfactory for some time. The price of steel causes some demurrer from buyers; but while billets are relatively high, there is little prospect of any change in price this year. Consumers expect to do better than $40 to $41, which is the common range of quotations for next year. Something depends upon the policy of new producers in Eastern territory. Buyers are expecting them to make lower prices. Muck bar, which has been weak, is now in greater demand and the price is expected to advance. We quote $31.50 to $32. The advance of $2 in bars made last week was only establishing uniformly what a number of sellers had been getting. We quote refined bar iron at 2.25c to 2.30c, delivered; steel bars, 2.50c to 2.65c. There is an easier feeling in plates, and mills are getting well over the congested condition that has been responsible for high prices. We quote 2.90c to 3c for tank steel. Consumers are not disposed to place large contracts and expect to profit by waiting. On structural material high prices are still paid for prompt delivery. Beams, channels, angles and tees range from 2.40c to 2.75c, delivered. Sheets are weak at 3.40c to 3.50c for No. 27, delivered. Old material is in active demand and high prices are being paid. Heavy steel scrap is selling from $12.50 to $22.50; choice railroad scrap, $25 to $27; machinery cast, $17 to $18; old iron rails, $26 to $28; old steel rails, $23.50 to $24; wrought turnings, $15 to $15.50; cast borings, $14—all delivered.

THE American Steel & Wire Co. announces that the fire at its Waukegan, Ill., works on Nov. 4 affected particularly the finishing end of the plant, the rolling mill not being damaged. The warehouse, with a fair stock of goods, was also saved. Arrangements have been made for the execution by the company's other plants, of the unfilled orders at Waukegan, and they will be taken care of, it is stated, with little if any delay.

THE usual bi-monthly examination of the records of shipments of bar iron during the months of September and October, in order to establish the puddling rate for November and December, is being made in Youngstown this week.

THE National Hardware Association will hold its annual session in Pittsburg Nov. 15, 16 and 17. On the evening of the first day a reception will be held at the Duquesne Club, and the session will finish with a banquet tendered by the manufacturers of Pittsburg.

The final subscriptions to the stock of the Sloss-Sheffield Steel & Iron Co. were called in on Nov. 8. The first call made when the company was organized, was for 20 per cent. Altogether there was $6,700,000 preferred stock and $7,500,000 in common stock issued. The company has four furnaces in blast, and expects to operate two more very soon.

ONE FURNACEMAN'S VIEW.

The following letter, from an officer of a Central Western blast furnace company, was not written for publication, but permission has been given to print it without name. It shows how many sided is the problem which now confronts both producer and buyer of iron. In the main it is optimistic and therein it chords with the general tone of sentiment throughout the trade. Yet it does not ignore the possibility of mistakes that may be costly:

"I may be a philosopher of the kind made in the school of adversity, but I lay no claim to much foresight, though my vision is remarkably clear looking backward; and as a prophet I have no honor, even with myself.

"Though not exactly fair, perhaps, one must largely consider his own feelings and circumstances in forecasting future conditions. We have not been materially benefited yet by the advance of 100 per cent in pig iron. Indeed, I think we would have more money to date if iron had remained where it was a year ago, and labor and material were on the old plane. Conditions will soon change, however, and our profits increase. We were so fully sold ahead for the first nine or ten months of this year that we have only been able to take on enough new business to offset the slight increase in the cost of iron. We are aware that the people whose coke we are using are not waxing fat or merry, and that the sellers of our ore are not happy. The consumers of our pig iron ought to be satisfied, but in most instances no doubt they put it into cheap jobs.

"What I am trying to get at is, that within our sphere business this year has been transacted on a low range of prices all around.

"Coke men, ore men, iron men, all are anticipating gathering in the shekels next year. May the Lord be on their side, say I.

"All branches of the iron business are fast approaching the present high level of current market prices, and by the first of the year will stand clear of old alliances. The question is, What then? What effect will the new basis of coke, ore, iron and labor, to say nothing about transportation, have upon the producer, and the great consumer—the general public? The world seems to be iron hungry! We had a long fast. How long will it take to gorge the stomach. It is useless to analyze the causes leading up to the present situation, or to generalize regarding the future. But there are some things to remember. One is the fact that the people of this country are at work—that is, all who want to or can. What this means in the way of consumption is almost incalculable. I saw a statement some time ago that impressed me strongly. It was that there were 13,000,000 families in this country depending largely for existence on their daily earnings, and that if the earnings of those 13,000,000 were increased $1 per week, $13,000,000 more would flow weekly into the channels of trade. Multiply this $13,000,000 by 52 and see what a home market we have made. Take the conditions over the past six or seven years, consider the wages of the unemployed, and then take present conditions, wages, etc., into account and see where you will land. The markets of the world are nothing when compared to the full employment of our own people at good wages.

"We must conclude, therefore, that the consumptive power of the country is large, and surely we have not arrived at the period of satiety. Will the present current prices cause a halt in consumption under existing conditions? That is the question of the hour. To the proper answer we are all giving our best thought. No one objects to paying a fair price for anything, if he can turn it at a fair profit. He considers the price he pays fair or unfair, high or low, according to his balance sheet. The ultimate consumer and payer is the individual. What we personally consume and spend makes the grand total. Prospering, do you hestiate over a little more railroad fare, slightly increased cost of living, a trifle higher prices for your household utensils and wearing apparel? Is it not a satisfaction to you to pay more, feeling that by so doing you contribute to the general prosperity in which you share.

"Does the farmer refuse to buy implements for his business because they cost more than a year ago? He will not buy under any circumstances if not in need, but will refuse to buy and go without if in need? Will new enterprises be held in abeyance on account of cost of construction if their consummation figures out a profit? Would they be put through on any basis of cost if they did not promise fair returns? Human nature is a factor in the problem. If people are prosperous they will buy, cost cutting little figure if they have the money. Of course things must be within the bounds of reason. Abnormal profits cannot continue long, as a general proposition. The law of supply and demand is ever in force. The chief element in consumption is the general employment of labor at good wages. Are our people to find such employment this year and next? In all avenues of business labor is now scarce. In what department is demand likely to cease that labor will be made idle or more plenty? It seems to me that for some time labor is to find ample employment at remunerative rates, and that so long as that condition holds consumption will go on and prosperity stay with us. Have we in reserve men and machinery to check the inflowing tide and turn it back? In time, no doubt, the increased use of machinery will tell, men will be displaced and the tide will turn. Is there any indication of this now? Are not all employers of labor seeking more men? Where are they to be found to increase the ore and coke supply, necessary to produce the pig iron to meet legitimate demands and check somewhat the existing anxiety for it? I do not know. If the present demand for the consumption of iron is simply a flurry, a craze, my logic is bad, and settling back to normal conditions we will have soon an over-supply, more ore and coke than needed, idle men, less consumption, dull times, lower wages—'93, '94, '95, '96 and '97 over again. Not considering the demand for iron and steel in all forms illegitimate, I do not look for stagnation and over-production next year.

"While prices are high enough, are they too high? We have not become accustomed to them yet, and herein lies one cause of hesitation and doubt just now. We have ventured far; is it too far? The makers of iron, producers of ore and coke, and labor, have for many years been working for nothing, and boarding and clothing themselves. Brawn and brain, raw material and plant, have been sacrificed to competition. The combination of capital and plants can prevent this in the future, if those in control have the sense and foresight requisite. Labor, transportation, ore, coke, manufacture, should all receive such remuneration as is necessary to fair living and fair profit. Let us hope they will, and thereby solve the problem of prosperity.

"For a period we may enjoy abnormal profits, for reasons quite apparent, but this will be temporary, and only until production overtakes consumption and stocks are on a reasonable footing. Not before navigation on the lakes opens again, and output is largely increased, can we expect much change. It seems to me less pig iron will be made during the first half of 1900 than is now figured on.

"Barring idiocy, therefore, I look for something like present prices through the coming eight months, with but slightly lower figures on sales for the last half of next year. The price of ore for next season will cut some figure. If it opens too high, I conjecture there will not be much of a rush to buy. Furnacemen will prefer taking chances later to over-loading at a price that may prove disastrous. We are all aware there is a good distance to fall and we will be careful how we approach the precipice. The problem is many sided, through the combinations, financial conditions, elections etc., and it's somewhat difficult for any man to come to any clear conclusion with himself. Eliminating the unnecessary and unexpected, I believe we are to have good demand and good prices for some time, through 1900, anyway, and that at some period in the future we will gradually settle to a lower level through the operation of natural causes. Profits will recede in time, as supply and demand adjust themselves to one another. This may not mean reduced consumption, by any means. Meantime, let the music go on, if no one loses his head thereby."

It is understood that the American Steel & Wire Co. failed to secure the additional land on Neville Island, below Pittsburg, which was required, and has decided to locate at Glassport, some distance up the Monogahela river from Pittsburg, where its extensive plans for blast furnaces and steel works will be carried out.

THE IRON TRADE REVIEW

AND

INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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NOVEMBER 9, 1899.

WE have referred from time to time to the prosperous condition of the iron trade of Great Britain and of Continental Europe, for its bearing on some questions affecting the duration of the remarkable revival in iron at home. The London *Iron and Coal Trades Review* has been at some pains to get opinions from well known iron and steel manufacturers in Great Britain on a question that appears to be asked with as much interest and uncertainty there as here, notwithstanding the boom in Great Britain began in 1896, while with us it is less than a year old. The question is, "How long will it last?" The correspondents of our London contemporary, in view of the fact that most of the British works have sufficient work on hand to keep them busy for nearly another year, agree that a continuance of prosperity is guaranteed for at least a year. Satisfaction is found in the freedom of British manufacturers from foreign competition, leaving prices to be fixed largely by the conditions of supply and demand at home. The famine in iron in Germany and the approach to that condition in the United States, are commented on as guaranteeing the British iron trade immunity for some time to come. Increased demand for rails and for tin plate are noted as especially encouraging signs in the British iron trade. These were the most unsatisfactory branches up to a few weeks ago, and now that they are in line, the outlook is regarded full of promise. It is not to be overlooked that these indications of the prolongation of prosperity abroad have an important bearing on the continuance in the United States of the period of splendid consumption and of remunerative prices upon which we have only fairly entered.

WE can safely say in advance that the views of a furnaceman on the outlook for demand and prices, as given in the letter printed elsewhere, will be read with interest. It is so rare that the men who are making history in the iron trade commit their philosophy of current events to paper, that special importance attaches to their words when they do speak. The furnaceman who goes into the market for his ores will find need to study hard on the problem that will present itself when ore prices are announced. At the moment the responsibility for hard thinking upon the future rests most heavily upon the ore producer. A deal of common sense and insight, and a good measure of uncommon sense, are needed if mistakes are to be avoided.

IN tonnage the September exports of such iron and steel products as are reported in tons increased about four per cent over those of August, and the same percentage over those of September, 1898. In billets and in wire rods there is a sharp falling off fom the shipments of the preceding September, but wire, wire nails and structural material show gains. The losses promise to be more marked in later months, in bars, rods and billets and sheet bars, but thus far the export movement has been maintained beyond expectations. We append the comparative statement:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	September.		August.	Nine months Jan.—Sept.	
	1899	1898	1899	1899	1898
Pig iron { ferro	.....	56	.....	13	3,481
Pig iron { all other	17,088	18,663	14,474	194,470	141,368
Scrap	7,073	6,359	4,497	68,754	55,806
Bar iron	844	871	1,215	8,918	4,491
Steel bars (not wire rods)	1,680	1,354	2,566	24,401	18,171
Iron rails	.....	457	106	5,260	1,807
Steel rails	27,060	26,846	29,567	185,128	222,974
Billets, ingots and blooms	44	2,397	92	24,741	19,983
Hoop, band and scroll iron	309	19	90	2,384	582
Wire rods	486	2,991	1,025	14,600	10,619
Iron sheets and plates	332	634	236	4,817	2,953
Steel sheets and plates	3,292	3,214	3,412	43,239	20,109
Tin plates, terne plates, and tagger's tin	3	9	22	97	22
Structural material	5,474	3,935	3,283	33,236	27,123
Wire	11,499	6,180	11,269	86,438	54,020
Cut nails	1,400	572	813	7,651	10,996
Wire nails	2,975	1,030	2,913	23,058	7,967
Other nails, including tacks	167	115	171	1,735	1,517
	78,966	75,702	75,751	739,840	603,989

Rising prices are making themselves felt in the values of our iron exports. The total for all iron and steel products, including machinery, was $8,559,368 in September; in September, 1898, it was $7,065,583—an increase of over 20 per cent. For the nine months ending Sept. 30, 1899, the value of iron and steel exports, including machinery, was $76,567,438, against $59,990,665 in the like period of 1898.

Values of iron and steel imports, notwithstanding higher prices, are dwindling. For September the total was $1,374,764, against $880,432 in September, 1898. Iron ore imports were 54,184 tons in September; in September, 1898, 3,445 tons. The total of iron ore imports from Jan. 1 to Sept 30 was 425,475 tons; for the corresponding nine months last year, 141,014 tons.

THE record of car orders in October is marvelous. Those reported by the *Railroad Gazette* give a total of 33,023, or three times as many as in September and two-and-a-half times as many as were placed in August. The single month of October almost equaled the record for June, July, August and September. A significant remark is made by our contemporary in this connection: "Some of the large orders placed in October have been deferred for many weeks on account of high prices." A parallel is found in the rail purchases at $33 made by railroads whose officers refused to contract at $31, because the price was too high. There are straws here for those who essay to predict a sharp cutting off of consumption because of high prices.

"REVOLUTIONARY" TIN PLATE PROCESS.

A West Virginia charter is being secured for the National Tin Plate Co., with an authorized capital stock of $3,000,000, the incorporators being N. E. Whitaker, of Wheeling, William Rogers, of Leechburg, Pa., J. C. McDowell, vice-president of the Philadelphia Co., Pittsburg, W. E. Tustin, G S. Lewis and W. E. Wilson, Pittsburg, and Charles and A. B. Daly, of the Wheeling Natural Gas Co. The company is being organized to employ a process for the manufacture of tin plate stated to have been invented by Mr. Rogers 30 years ago. Letters patent of the United States were issued to him May 17, 1898, No. 604,195. The application was filed Oct. 24, 1896 and a half interest is assigned to ex-Governor James A. Beaver, of Bellefonte, Pa.

The inventor propose to dispense with the first pickling, the cold rolling, and the second annealing, as ordinarily practiced. He proposes to pack the plates, after hot rolling, in a double box, the space between the two being filled with iron ore, sand, dolomite, or other refractory material, and then subject the whole to a temperature of about 2,500 F. for about 10 hours. He claims that by this action the "formation of further scale on the surface of the iron is prevented, and by the mutual reaction of the oxide on the surface of the iron sheets and of the carbon contained in the body of the iron it may both be deoxidized and decarbonized." Such an action is entirely impossible. The inventor has in mind iron sheets. In the case of steel sheets some pulverized oxide is introduced to assist in the "decarbonization." It is claimed that there will be considerable saving by the omission of several of the processes now involved in making tin plate, but experience and the claims of the inventor both show that if at all practicable the proposed process would involve the consumption of a great deal more tin than is now required, which would much more than overbalance any saving in another direction, besides producing a weak and unevenly coated plate.

THE TIN PLATE SITUATION.

A number of reports have been circulated in Pittsburg that the American Tin Plate Co. proposed to abandon the Monongahela and Star plants in that city. President D. G. Reid is a newspaper interview states that these plants will not be abandoned. They are now being repaired after their hard service during the brisk months. The land on which they are located is very valuable, but it might be difficult to secure an immediate purchaser if it were intended to abandon the plants. A number of other plants of the company are now shut down for repairs, and on account of the falling off in demand incident to the season. The rush during the summer months, especially for canning plates, prevented any important repairs being made then. The bulk of the tin plate is consumed during the warm months, and the period from the first of November through January or February has always been a dull one. In former years the independent tin plate makers were not in position to stand a prolonged shut down and were besides fearful of losing their trade by closing their plants, and the result was that in order to secure specifications running through these months the product would be sold for a period of six to twelve months to the large New York dealers, who had ample capital, the price being a fair one for dull months, though very unsatisfactory for the good months to follow; but the manufacturers had no recourse.

The American Tin Plate Co. has more mills in running order than ever existed in the country before, and is prepared on account of the increased number of mills, and the greater regularity with which they can be run when required, to meet demands as they arise, while it is not under compulsion to run on stock plates for fear of losing trade or to provide funds; so that the policy has been adopted of adjusting production quite closely to the consumption. This policy could not be carried out completely during the summer, and until recently spot plates commanded a premium of from 10 to 15 cents over mill shipments, but with the close of the canning season this differential has disappeared, and spot deliveries can now be had at the regular prices, which are on the basis of $4.65 at mill for 100-pound coke plates, with 15 cents rise for full weight. This price has been in force for some time and there is no probability that it will be changed in the near future. Since its establishment pig tin has advanced, but is lower again, and the cost of raw materials is about as it was when the price was first named.

It is believed that in the near future the offices of the American Tin Plate Co. will be removed from Chicago to New York City, along with those of the National Steel Co.

FINAL DECISION ON METAL MIXER CASE.

The very interesting and important legal battle which has been waged since 1895 with the object of sustaining the patent of the late Capt. Wm. Jones on a metal mixer, has been finally ended by the refusal of the United States Supreme Court to grant a writ of certiorari to bring the case before it from the United States Circuit Court of Appeals. The suit had been brought by the Carnegie Steel Co, Ltd., controlling all the Jones patents, against the Cambria Steel Co. Last August the case was decided in favor of the Carnegie Steel Co. in the United States Ciruict Court. This decision was reversed in the United States Circuit Court of Appeals, and an application was made by the Carnegie Steel Co. to the United States Supreme Court for a writ of certiorari to bring the matter before that body.

The case is of the utmost importance, as, if the patent had been sustained, a monopoly of the use of "direct metal" in the present manner would have been assured to the Carnegie Steel Co. The patent was granted to Capt. Jones on a mixer for metals, the present application of which is to employ a large vessel into which blast furnace metal is poured, metal being withdrawn as desired for conversion into steel. The metal as it comes from the blast furnace is not sufficiently uniform but in the mixer a composite metal is produced which is sufficiently uniform. The final decision involved several important points of law. The claim on which the suit is based refers to the mixing of any metal, and the court held that the disclaimers filed by the plaintiff, as to the application of the claim to other cases, did not act as real disclaimers, their avowed purpose being instead to limit the scope of the patent to its present use, which the court held was its original limit. The records showed that the Cambria device had been in use at those works ever since the Bessemer process was introduced there, first at the cupola and later at the blast furnace. Its function was to receive the metal as it was heated and allow it to be tapped as desired, so that the process of Bessemerizing might proceed at any desired speed. The court held that while there was mixing, it was only such mixing as was incidental to the pouring together of mixable liquids under the well known principle of diffusion. Then the court pointed out that the patentee himself had acquiesced in the finding of the patent office that he was anticipated in these matters by the Witherow patents and Kirk's publication. The defendant's reservoir could not be an infringement through the fact of the incidental mixing, by the action of well known laws, unless it carried some additional element set forth in the patent. If the additional element be claimed to be the drawing from several furnaces, then the British patent of Deighton in 1874 anticipates this feature.

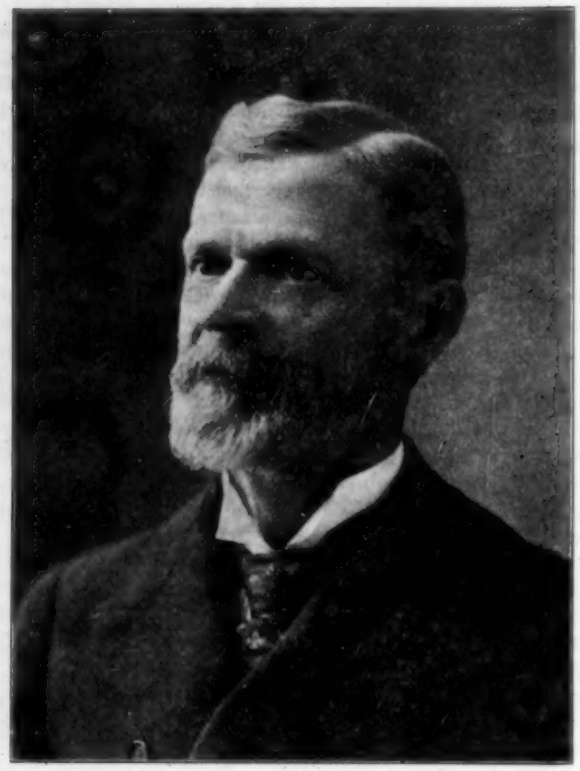
THE sale of the James P. Witherow foundry and machine plant at New Castle, Pa., to J. V. Reis and associates, for $107,000, was not confirmed by the court, holders of mortgages claiming that the Union Construction Co., Pittsburg, stood ready to pay $120,000 for the property, and the American Steel & Wire Co., $140,000. The trustees asked that they be required to give bond in the sum of $20,000 that this latter price would be paid in case a new sale was ordered. The case has been adjourned until Monday next when a new sale will be ordered if the bonds are presented.

THE partnership between J. H. Hillman and J. J. Gray under the firm name of J. H. Hillman & Co., Iron Exchange Building, Pittsburg, was dissolved Nov. 4 by mutual consent, by the retirement of J. J. Gray. The business will be continued by Mr. Hillman and his son under the firm name of J. H. Hillman & Son.

THE SELLING SIDE OF THE TRADE.

Representatives of Well Known Iron and Steel and Equipment Firms.

The portrait below is that of J Wendell Cole, member of the American Society of Mechanical Engineers, and for the past 20 years well known as district manager for the Detroit Emery Wheel Co., in Pennsylvania, Ohio, Indiana, Illinois, and Wisconsin, and also for Wm. Sellers & Co.'s tool and drill grinding machinery in these states. Mr. Cole began his work with six years in the machine shop and drawing room, mostly with the Novelty Iron Works, of New York City, on steam ship engines, etc. Later he took hold of office work in New York, becoming secretary of the company exploiting some mechanical matters for the Duryeas, of starch



J. WENDELL COLE.

manufacturing fame. Later he went "on the road," selling engines, steam pumps, saw mills and grist mills. Much of Mr. Cole's success is owing to his methods of handling advertising and correspondence, growing out of his experience in developing a mail list, by the advice of O. D. Munn of the *Scientific American*, at the time the emery grinder was projected. Though his early practice was intended to make Mr. Cole a successful manager of manufacturing interests, circumstances led him into the commercial line of mechanics, and he has made that the more successful because of his early training in construction.

Pittsburg Foundry Arbitration Without Result.

No agreement was reached at the arbitration last week of the difficulty between the machinery molders and coremakers in the Pittsburg district and their employers. The employers were represented by O. P. Letchworth, president of the National Founders' Association, I. W. Frank, of the Frank-Kneeland Machine Co.; Wm. Yagle, of Wm. Yagle & Co., Ltd.; Robert Taylor, of Taylor Wilson & Co.; George Mesta, of the Mesta Machine Co.; George Hogg, of the Totten & Hogg Iron & Steel Foundry Co.; F. H. Zimmers, of the Union Foundry & Machine Co., and J. H. Noble. The men were headed by J. F. Valentine, vice-president of the Iron Molders' Union of North America, and a local committee. The conference was held in the city branch office of the Frank-Kneeland Machine Co., Smith Building. The employers showed that since the beginning of the year they had advanced the wages of the men an average of 10 per cent, and offered an additional advance of 5 per cent provided the men would sign a contract that the advanced wages remain operative for a year. The men refused to accept this proposition and contended for their original demand, the establishment of a minimum of $3 a day for molders and $2.75 for coremakers, with an advance of 10 per cent to all who were making this amount or more. Toward the close of the conference they offered to forego the demand of 10 per cent but insisted on the establishment of the minimum rate. The failure to arbitrate the matter locally now throws the adjustment to the national bodies, the Iron Molders' Union of North America and the National Founders' Association, by which bodies it will be taken up in accordance with the terms of the New York agreement.

PERSONAL.

Andrew Carnegie sailed for the United States on Nov. 2, on the Oceanic.

Philip Riter, formerly manager of Olive furnace, Lawrence County, O., has gone to Bear Spring, Tenn., to have charge of Bear Spring charcoal furnaces.

Chas. N. Kuntz, for 10 years purchasing agent for the Wrought Iron Bridge Co., of Canton, O., with headquarters at Pittsburg, has organized the Standard Bridge & Structural Co., in which New York and other capitalists are interested. It is the plan to build a plant in the East.

Capt. M. Yamonochi, of the Imperial Japanese Navy, for some years the permanent inspecting officer in England of all the work undertaken for his government in that conutry, has been making an inspection of the Carnegie and other large Pittsburg plants. He has also been over the Bethlehem Steel Co.'s works at South Bethlehem, Pa. Capt. Yamonochi saild for Japan from Vancouver on Nov. 6.

Edward Shearson has been appointed assistant to the president of the Federal Steel Co. Mr. Shearson was formerly auditor of the Wisconsin Central and Chicago & Calumet Terminal railways, and more recently was auditor of the American Steel & Wire Co.

S. M. Goodman, until recently manager of the Riverside plant of the American Tin Plate Co., has gone to Chicago to take a position in the general offices of the company.

S. H. Chauvenet, formerly manager of the Robesonia Furnace Co., has taken charge of the Sheridan furnaces at Lebanon, Pa., succeeding John S. Kennedy, who has taken charge of a plant in New Jersey.

Simon Joseph has resigned as superintendent of the Indiana Forge & Rolling Mill Co. plant of the Republic Iron & Steel Co., at New Albany, Ind.

W. C. Reilly, chief clerk, has been made assistant to District Manager Campbell, of the Republic Iron & Steel Co., Youngstown, O.

Samuel R. Smythe, president of S. R. Smythe & Co., constructing engineers, Pittsburg, died Oct. 27, aged 39 years. He was trained at Owen's College and Conway College, South Wales. His brother H. E. Smythe, has been associated with him in business.

Henry C. Frick has made a gift of $25,000 to Wooster University, Wooster, O., for a new library building. The gift was announced on Nov. 3, in connection with the inauguration of the new president of the university, Rev. Louis Edward Holden.

Wm. F. Durfee, the well-known architect and engineer, is seriously ill at his home at West Orlie, Staten Island, and it is believed cannot recover. He was the engineer of the original experimental Bessemer steel plant built at Troy, N. Y.

National Steel Co. Offices Go to New York.

The statement that the National Steel Co.'s headquarters will be removed from Chicago to New York has been authoritatively confirmed. Judge Wm. H. Moore, the promoter of the steel consolidation, as well as that of the tin plate plants, and a member of the board of directors and of the executive committee of each, has decided to remove his offices to New York and this with other reasons decided the action of the company. It is understood that New York would have been made headquarters originally, but for the fact of Judge Moore's residence in Chicago. The American Tin Plate Co.'s headquarters, it is also expected, will go to New York. Those of the American Steel Hoop Co. will remain at Pittsburg, as at present.

STEEL IN A BLACKSMITH SHOP.*

BY H F. HINKENS.

Steel working is the most important branch of blacksmithing and there is not one smith in twenty fully competent in this particular branch. Most smiths have notions at variance with the laws governing steel, and for the reason that they are not close observers of cause and effect, lose sight of the importance of the necessity of working intelligently and planning wisely. The tool smith should know the carbon points of steel he is working. For example, if he has been in the habit of making milling cutters out of steel containing 125 carbon points he knows just what degree of heat is suitable for the right temper. If he should perchance, receive a piece of steel with only 110 carbon points he would get the milling cutter too soft, yet he could in either case make a satisfactory tool if he knew the carbon points. Purchasing agents should bear this in mind, and furnish the mechanical department what it calls for. Find out what carbon points are suitable for the purpose required, and if you will change, notify the mechanical department, or else you will confuse the temper, for he cannot discern the difference by inspection.

The carbon points as used in the St. Paul & Duluth shops with relation to the various purposes for which our tools are required, are as follows; a point in this case be being one-hundreth of one per cent of carbon: One hundred and fifty carbon points, suitable for lathes, planes, boring car wheels, etc.; 135 carbon points suitable for large lathe and planer tools, medium size dies, etc.; 125 carbon points suitable for taps, reamers, and drills; 115 carbon points suitable for screw cutting dies, chisels, punches and milling cutters; 105 carbon points suitable for cold chisels, punches, dies, large taps, milling cutters, small shear knives; 95 carbon points suitable for large punches, shear blades, large dies and some blacksmith tools; 85 carbon points for stamping dies, hammers, cold sets, track chisels and smith tools, and 75 carbon points for swedges, flatters, cupping tools and blacksmith tools generally. In ordering steel give the temper, or state the purpose for which the steel is to be used. Once in a while the steel worker will complain that the steel varies and the results are not always the same; the trouble is that he gets hold of the wrong bar, or gets the bars mixed by mistake.

The carbon points given are obtained from average results, but must not be adhered to strictly, as conditions may necessitate a deviation. Take a chipping chisel containing 125 points, such as we use in the tool room for fine and delicate work, and for comparison we will take a boiler maker's chipping chisel containing 105 carbon points; now, here are conditions that cause a large variation, a difference of 20 carbon points in the two chisels. Again, a lathe tool for turning hard tires, tool steel, or for hard roll turning will require 150 carbon points, whereas a lathe tool for turning bolts or soft material will require from 125 to 135 carbon points. The speed of the machine and the nature of the material to be cut are factors in determining carbon points, and there are no hard and fast rules.

It is very discouraging to the steel maker to find that after all his care and expense, his product is abused in heating after it leaves the mill. The proper heat is learned only from experience. If the toolsmith, in forging a tool, were to reduce a piece of steel from 6-inch to 3-inch in diameter, he would use a higher heat than in reducing a piece of steel from 2-inch to 1¾-inch in diameter. In the first or larger piece he heats up to a coarse grain, but the hammering to bring about this reduction refines the steel and no harm is done. If the second or smaller piece is heated up to the same high heat as the first piece, you start with the same coarse grain as in the large piece, and a reduction of only ¼-inch in diameter under the hammer is insufficient to hammer-refine the steel; besides the larger piece will hammer-refine and reduce in heat at the same time. Not so with the smaller piece; it will receive no hammer-refining and the high heat will leave its structure coarse.

I wish to call attention to the use of old axle steel for blacksmith shop tools, when only the factor of battering and abration is to be taken into account, such as flatters, fullers, sledges and sets, and all tools that call for from 60 to 70 carbon points in crucible steel. Of course, we know that axle steel containing from 40 to 45 carbon points will not ordinarily withstand battering, but we have experimented, and with good success, in utilizing some of our old steel axles for the above mentioned tools. Our method is simply to harden the head, and on such tools as flatters and sets to harden both the head and face. The process merely involves a determination of the proper temperature which can be permitted for hardening in water, and I find that some caution is necessary to obtain the desired result. If the heat is too low, the temper in the tool will be too soft to withstand battering, and again, if the heat is too high it will hasten the destruction of the tool by causing the head to break away, and for the reason of not knowing the exact carbon points, there is no means of absolutely determining the right heat, and therefore our only guide is to calculate for its action under the hammer. Axle steel containing 45 carbon points should be drawn or tempered to a second blue. This will change the steel from a loose to a combined condition, thus making the working parts, or the parts that receive the blow, more compact. We have in use in our shop tools made from old axle steel that are just as serviceable for the purposes mentioned as any crucible steel of 60 or 70 carbon points.

* From a paper read before the Northwest Railway Club..

Expansion of American Ship-Yards.

The extent of the American shipbuilding interests is reflected in the recent bidding upon the new cruisers authorized by the latest session of Congress. There are 10 cruisers to be built and there were bids from 14 builders. There are, then, at least that many shipyards where large vessels can be constructed and fitted out. These yards have not come into existence by Government demand, but have grown under natural conditions. There are other yards, not represented in the bidding, which are well known. All are busy, principally in creating an American merchant marine, without subsidies or special favors.

Not many years ago there was only one shipyard in this country capable of building a large cruiser. The inference is plain to those who care to draw it. There is a revival of American ship building from natural causes—the most active of these being the cheapness of American material. This movement will continue until the American merchant marine has attained its old-time standing and American ship building leads the world. No subsidies are necessary. The subsidy acts are simply intended for the enrichment of certain interests which desire an extra return from their investments in particularly high-speed vessels.—[Pittsburg Dispatch.

THE Napier, Tenn., furnace (charcoal) will start this week. Considerable repairs have been made and an amount of raw material accumulated to insure a steady run. The Napier furnace has been out of blast for several years, but the brand will be remembered as one that was used for car wheel and foundry purposes. The furnace will use all brown ore, and its fuel will consist of charcoal with a mixture of low sulphur coke. It is expected that the coke will have a beneficial effect in opening up the grain of the iron and adding the requisite amount of silicon. The product will be handled solely by Rogers Brown & Co. and branch houses.

THE Eleanor Iron Co., with works at Hollidaysburg, and office at Tyrone, Pa., will start its 10 inch mill in a few weeks to roll rounds, squares, flats, hexagons and small skelp. Orders entrusted to the company will be promptly rolled and shipped.

Application for the charter of the Union Steel Co., Pittsburg, will be made to the State of Pennsylvania on Nov. 13, by W. H. Donner, A. W. Mellon, R. B. Mellon, W. S. Mitchell and C. F. Farren. The object of the corporation is stated generally to be the manufacture of iron or steel, or both, or of any other metal or article of commerce from metal, wood or both.

The Meehan Boiler & Construction Co., Lowellville, O., has about completed a new stove for Mary Furnace, of the same place.

HULETT AUTOMATIC ORE UNLOADER.

Mention has been made of the erection at the Carnegie docks at Conneaut, O., of the Hulett patent automatic ore unloading machine. The manufacturers are the Webster, Camp & Lane Machine Co., of Akron, O. Experimental work is still in progress; therefore we reserve for another occasion details of the performance of the machine, presenting herewith two views. Fig. 1 shows the machine with the clam-shell bucket in the hold of the vessel. Fig. 2 shows the position of the bucket filled with ore, and the position of the walking beam as the bucket is in position for travel to discharge its contents into the car.

Omitting details at this time, it may be said in brief that the machine consists of a heavy steel structure, with principal members of plate girder construction, traveling lengthwise of the dock. Traversing the top of the main structure and moving at right angles to the dock is a heavy walking beam, at the outer end of which is a depending leg carrying a 10-ton clam-shell bucket. This leg is always kept in a vertical position by means of a parallel motion as shown in Fig. 1.

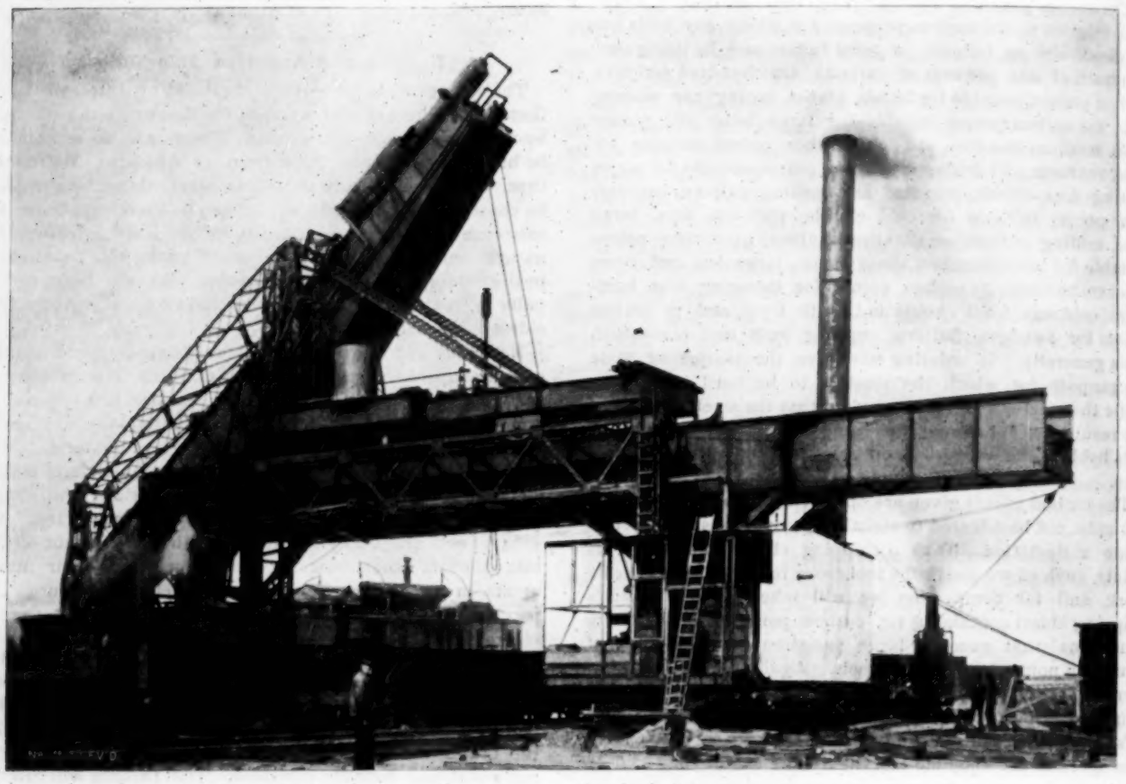


FIG. 1.—HULETT ORE UNLOADING MACHINE.

The bucket end of the walking beam is counter balanced by means of the hydraulic accumulator located at the opposite end. The whole machine is moved lengthwise of the dock by means of a pair of engines geared to the wheels on each main leg of the structure, while all other movements on the machine are accomplished by hydraulic power through suitable cylinders. All the operating levers are grouped in the depending leg so that the operator travels with the machine, his position being directly above the bucket.

This machine has a capacity for handling 10 tons of ore at a time from modern boats having hatches not less than 10 feet 6 inches long by 7 feet 9 inches wide, at the rate of 250 tons per hour. The machine is designed to lift the ore from the vessel, and the bucket discharges into cars on either one of two tracks at the front of the dock or into a hopper at the back of the dock when it is desired to stock the ore. This hopper may be drawn back and dumped into a storage bin or into a tram car designed to be drawn back on the conveyor bridge. Hydraulic power for all movements, except traveling along the dock, is provided at a pressure of 700 lbs. by means of a Duplex compound pressure pump and steam accumulator.

Business from the Boiler Trade Standpoint.

Not even the keenest observer of commercial affairs can obtain even a fair estimate of the future of iron and steel. Each year should show a gain over the previous one, otherwise our civilization would retrograde. This gain, however, is not uniform, or the problem of providing for the future would be simple; but it moves like the tide, with its ebb and flow, with each advancing wave at a higher scale of demand. There is nothing to indicate that the demand has yet reached its maximum. The demands of labor at such times as these are always a menace, and, save in a few rare instances, their reasonable requests for a share in the improvements have been granted. So far there has been an ample supply of money, but there is danger that our inflexible monetary system may be inadequate for carrying the present enormous volume of trade. This will lead to a larger use of credits with possibility of dangerous inflation.

Heavy plates and boiler tubes are higher than a month ago. Black and galvanized sheets, being in stock in every village in the land, are subject to the influence of timid holders, and so have softened in value. Other lines are unchanged. These are the days when the laggard is paying for his little faith, and in rushing in to swell the stream of buyers. The exhausted "bear" often becomes the most rampant "bull." We wish we might report the settlement of the labor troubles here. The strike of the boiler makers has been "on" since July 1. The loss to all may become irreparable, and it is discreditable that some wise agency is not sought for bringing masters and men together and removing this sore spot.—[The Boiler Maker, Chicago.

EXPORT pig iron rates were advanced, effective Nov. 1, on shipments to South Atlantic and Gulf ports. The advance will be 50 cents per ton, making the rate to New Orleans $1.90, to Mobile and Pensacola $1.50, and to South Atlantic ports $2.25.

The Republic Iron & Steel Co. has advanced the wages of the laborers at its Sharon Pa., plant 15 cents a day, to $1.50.

FOREIGN DEMAND FOR MACHINERY.

The British Market for American Machine Tools.

Charles Churchill, president and managing director of Charles Churchill & Co., Ltd., with headquarters at London and branches in Birmingham, Manchester, Newcastle-on-Tyne and Glasgow, is making his regular autumn visit to the United States, transacting business with the large number of machine tool concerns whose product he has done so much to introduce and to make common in the British Isles. Mr. Churchill went to England from this country in the early sixties. His thorough acquaintance with industrial and mechanical development there has enabled him to build up a large business in American machinery, the increase being especially marked in the past five years. In the past three years his company has handled $3,000,000 worth of business and orders now on hand for American machinery are said to aggregate $500,000. Mr. Churchill made the following statements to the New York *Commercial* concerning the building up of this trade and its status today:

"A few years back there was a decided English prejudice against everything American, but now all that has worn off. The trade unions are no longer the power they were, their hold having decidedly diminished since the last engineering strike. The 'one man, one machine' question is rapidly dwindling to nothingness. In plain English, if Britain wants to retain her position in the world's trade she will have to look to America for improved labor-saving tools. Her plants will in time become antiquated; in fact, several first class shops are now equipped with machinery of a type which has been obsolete in this country for some time. Of course, there is the question of the advantage the British might secure in the world's markets by a wholesale adoption of our up-to-date machinery, but I doubt if such a contingency will be encountered during our generation. Moreover, the world is growing and fresh fields will be discovered year by year.

"Among the recent American equipments which I furnished n England were several radial drills, which were installed in the plant of John Brown & Sons, the large government armor plate builders of Sheffield. The admission of American tools into such a conservative establishment was reckoned quite an innovation. The drills were manufactured by the Bickford Drill & Tool Co., of Cincinnati. Armstrong, Whitworth & Co., and other large shipbuilding and engineering firms are being supplied with boring mills manufactured by the Bullard Machine Co., of Bridgeport, Conn. The Cleveland Automatic Screw Co.'s specialties are being furnished the machine shops of the London & Northwestern and Great Northern and Great Western railways. I have distibuted over 600 Cleveland screw machines within the last three years. This represents a sum approaching nearly $500,000.

"The British Government arsenal at Woolwich is equipped with 40 gas furnaces, which are utilized for annealing, tempering and hardening projectiles. The furnaces were manufactured by the American Gas Furnace Co., of New York. The Birmingham small arms factory, which supplies the government largely with arms, is also fitted up with American furnaces. Quantities of various American machinery and tools for making parts are being adopted by Asa Lees and other large cotton mill owners in the Lancashire district.

"Though it is against the rule to put agents for foreign made tools on the Admiralty or other Government contractors' lists, quite a number of American manufactured goods are being called for; in fact not a day passes without our being given an order for American machinery and tools of some description. Emery wheels made by the Brown & Sharpe Mfg. Co., of Providence, R. I., are in great request. American micrometers for measuring to 1-10,000th part of an nch are also furnished from the works of L. S. Starrett & Co., of Athol, Mass. The goods are supplied the British Government with the American name stamped upon them."

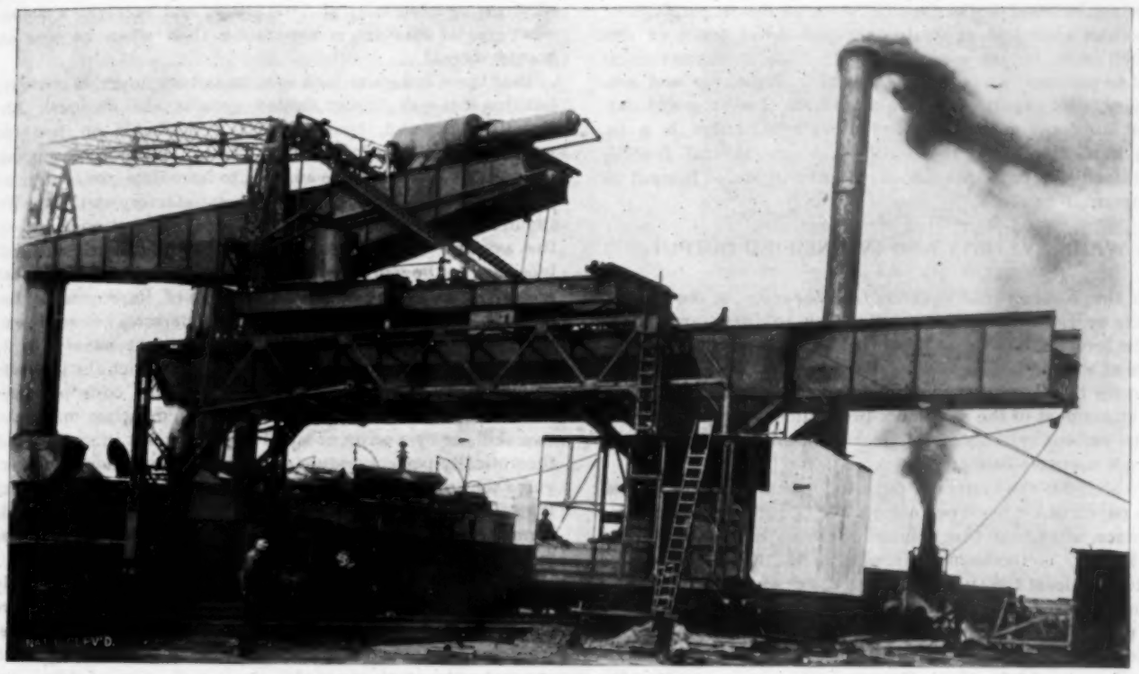


FIG 2.—HULETT ORE UNLOADING MACHINE.

American Machinery in Germany.

A continued flow of inquiries, not only for machinery and tools but for many other lines of manufactured iron products, is said to be arriving from Germany, despite the fact that deliveries from here are impossible for at least four or six months. An agent for one of the leading machinery importing houses in Berlin, which has branches in several of the principal trade centers of Europe and local offices at 39 and 41 Cortlandt st., claims to have sent quotations to the home office within 10 days for upwards of $200,000 worth of American tools for machine shop work. In every instance, the local agent says, he has been obliged to make it clear that large orders cannot be executed or in fact delivered until early in the spring of 1900. The stock held on hand by manufacturers of tools and machinery has so advanced in price that purchasing it for foreign demands would involve an expenditure of 45 to 55 per cent over the cost of the same product two or three months ago. For this reason no very large transactions are taking place. The buying under way in this branch of trade is small and will only cover for a period to come such

purchases as are absolutely necessary. The demand from Russia is keeping mills and iron works of Germany filled with work. The reason why these orders are going to Germany is on account of the financial backing which many Russian undertakings have found in Berlin. Occasionally these large Russian and other foreign contracts compel German works to make an outlay for new machinery and tools and as they cannot be secured at home the American agents at Berlin derive the benefit of this demand by taking orders even at the present advanced prices.

It is stated by those in a position to know that it is the German foreign trade that has compelled American tool manufacturers to erect works in that country. By March of 1900 at least three such works will be in operation near Berlin, turning out the latest type of American machine tools and other labor-saving devices. The uncertain condition in Germany as to the prices of coal and pig iron, it is claimed, will greatly interfere with her foreign trade, as mills and manufacturers scarcely know how they will stand two or three months hence. No less important is the German demand for other lines of manufactured goods. In hardware the business being done direct by manufacturers and through export houses is the largest in many seasons. The weekly shipments of sewing machines are averaging $15,000. In raw material, such as copper, tin and lead, an unprecedented trade is in evidence with Germany. If it were not that the German electrical works are so adverse to the importation of American electrical apparatus, the volume of trade in this branch could be increased for their home consumption at least 60 per cent, while, as it is, all such apparatus and machinery is for export. The inquiries from Hamburg and Berlin of late for plumbers' supplies indicate that there is a future in Germany for the business, which several leading manufacturing firms are about to investigate.—[Journal of Commerc, New York.

WAGE SYSTEMS AND INTENSIFIED OUTPUT.

In the November *Engineering Magazine* is the second article by J. Slater Lewis, a well-known engineer and author of the foremost European work on the "Commercial Organiation of Factories," on the general theme of "Works Management for the Maximum of Production." The labor factor in the attainment of the maximum production, and the bearing of the various systems of remuneration, are considered in the extract we make below:

To abandon the system of payment by time and to substitute payment for work performed is a considerable economic advance, alike from the point of view of the employer and workman. To the former it means, under the most inelastic system, at least the substitution of a known for an unknown element in cost. To the latter it opens up, for the first time, the possibility of realizing, even though only upon a small scale, the saitsfaction of individual enterprise which otherwise do not exist for him. But even where we agree that the workman's reward shall be proportional to his work, this reward may be made immediate, definite and personal, or dependent on the co-operation of numbers, and realized only as a share of a general result. The former of these is exemplified by all systems of the "contract" or "piecework" variety and the latter by the so-called "profit-sharing" methods. However useful these last for the development of *esprit de corps* in certain special kinds of business where the volume of trade and consequently the statistics of employment, are fairly constant, it cannot be said that they fulfill the vital condition of an immediate and personal spur to the intelligence of the individual operative. Of these two classes of remuneration by results we must look rather to the piecework than the profit-sharing variety to produce direct and immediate reactions.

It cannot be pretended, however, that the piecework system, as usually employed, commends itself as a satisfactory, still less as a final, solution of the problem. We obtain, it is true, an immediate definition and limitation of cost, coupled with a strong and direct inducement for the employee to exert his best endeavors to increase and intensify production. At least, this is the theory; but in practice it is a true statement of the result only within very narrow limits. The defect of the method is, that when once the workman has begun to derive a profit from the transaction, the employer has no *direct* interest in his further exertions, but only the indirect advantage of a stationary labor-cost coupled with a greater intensity of output. The general result of this is, of course well known and understood. There inevitably comes a time—if the workman continues to improve in skill, or to give evidence of a continuous and successful application of intelligence to his work—when the gains of the workman are excessive compared with his former earnings as a mere supplier of labor by the hour. The employer would be more than human who did not, at this stage, ask himself the question, "Have I not made a mistake in fixing prices?" When this question is answered affirmatively, a reduction of rates inevitably follows. The suzerain power insists on remodelling the convention, and the result is frequently—not peace but soreness. Of course, where much piecework is in vogue, the trouble does not necessarily arise with as much frequency as might be expected, for a very good reason. As soon as the workman finds himself approaching the point at which his extra earnings tend to rise beyond the limit at which the traditions of the shop teach him the reduction may be expected, his efforts slacken. He makes no endeavor either to improve in skill, or to trouble himself about little tricks for the better management and handling of his job. His interest for the future is barred, and the net result amounts to this—that he has adopted a somewhat greater intensity of production, and receives a somewhat greater constant remuneration than when he was on hourly wages.

That there is a gain, both to man and employer, is obvious; but that it is a slight and limited gain is also obvious. Abstractly considered, the method is remarkable no less for what it wastes than for what it effects. From an examination of its defects, we are enabled to formulate the conditions which must be fulfilled by a more satisfactory method. We require: (1) a minimum standard of remuneration based on the average attainments of hourly labor; (2) free and full incentive to the workman to improve upon this average, not merely up to a certain arbitrary stage of improvement, but without limit; (3) participation of interests between employer and workman in this improvement not merely in its early stages, but to the ultimate extent to which the intensification of output and consequent reduction of costs per piece can be carried, either by constantly augmenting manipulative skill, or by a series of small improvements in method. A theoretically perfect system of remuneration should not involve the constant comparison between the piecework earnings of the exceptionally clever or skillful workman, and his former earnings when neither exceptional skill or cleverness were asked for, nor sought to be rewarded.

It may be objected that this theoretical perfection is actually realized to the full by the piecework system, if only we assume that rates shall never be cut. This is of course, true; but it is not the whole truth. The element of participation by the employer in the direct reduction of labor-cost is entirely wanting, and that such participation is essential and just can be seen readily enough. If it be true that the actual reduction is wholly due to the efforts of skill or of intelligence exerted by the workman, it is equally true that the opportunity for such exertion is provided by the enterprise, and perfection of technical and business organization of the firm.

It is the absence of provision for reward of the employer's foresight and organization, collaterally with remuneration of the workman's skill and intelligence, that is the fundamental weakness of the piecework system. The "big figures" go to swell the workman's earnings alone, and the employer feels that he must do something to preserve equillibrium. The only thing he can do is to cut rates. But this is like killing the goose that lays the golden egg. The excessive earnings of the workman are certainly pruned away, but so, unfortunately, is his alertness to profit by every opportunity to intensify production. This is a moral effect that cannot be scheduled, or reduced to graphic form. On the other hand, there is no reason to suppose that the 25 per cent or 30 per cent advantage in intensification, which is the normal result of the adoption of pieceworking, is a natural limit of productiveness. Even though it be assumed that this represents the maximum development of more manipulative skill likely

to result from any possible incentive that can be offered, no such assumption can be maintained as regards that class of work in which the application of wits can be made to influence the quantity of output. Limits cannot be set to the workings of intelligence, and it is certainly to the employer's interest to foster, and not to throw a damper on, such efforts. Yet the adoption of an arbitrary standard of maximum earnings cannot have any other influence than this. And while the employer has only an indirect advantage in the greater rapidity of production, and does not feel the benefit in reduced labor-cost per piece, when once a price for the work has been agreed upon, it is evident that he cannot afford to look with equanimity upon profits, which his organization and foresight have rendered possible, going entirely into the pocket of one party to the bargain.

From these considerations the conclusion is forced upon us that, although pieceworking is a decided advance, other things being equal, over hour-wages, in realizing a higher intensity of production, yet it does not in practice do as much good, as, at first sight, it seems to promise. It opens, but does not keep open, the door to that individual development of the skill and intelligence of the workman that we commenced by postulating as a desirable feature. And its failure to do this is because such development can only take place at the expense of the employer, and we are not able to bring into the calculations the share of the latter in producing the total result.

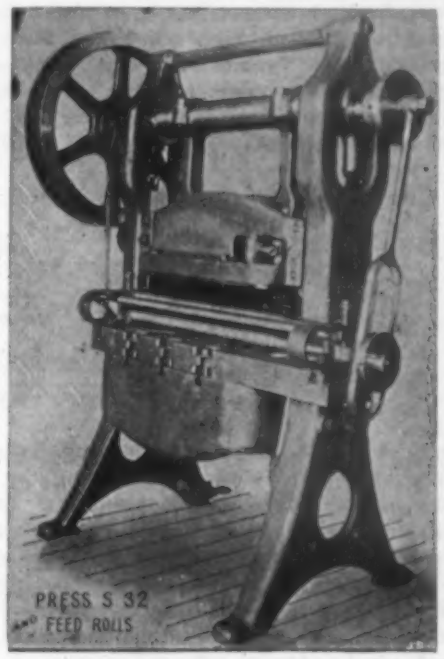
That these unsatisfactory features have tended to discredit the methods of payment by results cannot be doubted. From the workman's point of view, no less than from the employer's, there is dissatisfaction with a method that renders something short of absolute justice to either party; the workman is no less keen to look with suspicion on a periodical readjustment of rates than the employer is to question the expediency of permitting large balances to mount up in constantly increasing ratio. These admitted deficiencies have of late years, and particularly in the United States, led to attempts to remodel the fundamental basis of contract work, and to bring about a real identity of interests between employer and workman in the direction of uninterruptedly increasing the intensity of production, to the mutual benefit of both parties.

The essential peculiarity of this method is that a resultant saving of production-cost is divided between the workman and employer, the proportion between the two shares being variable according to the special conditions of the work. It is manifest that were the piecework system really efficient in calling out the best energies of the workman—not merely up to the "critical" rate (by which is meant the rate at which, in any particular shop, further reduction in cost would lead to a revision of prices), but beyond it to the ultimate practical possibility—the premium system would scarcely be a serious rival as regards popularity with employees, since, instead of the whole saving going to the workman, only a portion, depending upon the ratio fixed on, goes to him. But in a few cases in which evidence is available of the working of this method, the actual result seems to be, what indeed may be expected from the considerations discussed above, that production cost does tend constantly to diminish. This is because the important feature of the newer method is not that the saving is divided between employer and workman, but that no artificial barrier, no "critical rate" of earnings looms in front of the latter to dampen his activity and lead him to slacken his energies. At the same time, the significance of a high rate of earnings by the workman is entirely changed. Of its satisfactory appearance to the man, nothing need of course be said; but it becomes also a satisfactory phenomenon to the employer. In fact, it is an index, not merely of increased intensity of output, but of actual reduction in direct cost per piece.

It would appear, therefore, that in the long run the premium system will tend to displace existing methods of remunerating labor. It has, of course, certain theoretical disadvantages which must be opposed to the benefits it offers. Its immediate incentive is not so strong, and it is, therefore, on this account perhaps more suitable for repetition work than for work recurring at comparatively distant intervals. The fundamental principle of the method—that rates once fixed are never to be cut, whilst conditions remain the same—will require very careful observance in order that the confidence of the workman may be won for it. And this principle may, in careless or unscrupulous hands, be made to clash with the necessity for revising the rates when alterations in design have taken place, or modifications of process have disturbed the original fixture. These are elements of danger peculiar to the system; because *unless* the principle of permanent and unalterable rating is made and accepted in good faith by both sides, and so maintained, the premium method does not, in appearance at any rate, offer the same advantages to the workman as the older method. And its popularity would certainly be seriously shaken in any shop where alterations, under the special circumstances just mentioned, were made the excuse for reducing the workman's share in more than fair proportion.

CUTTING PRESS WITH FEED ROLLS.

One of the metal-working presses of the Ferracute Machine Co., Bridgeton, N. J., is shown in the accompanying cut. It is known as press S 32, and is arranged with feed rolls for cutting or perforating materials. The weight of this press is 6,550 pounds. There are about 120 sizes and styles of these "S" presses, which are used for cutting out very large articles in tin, brass, copper, sheet iron, card board, paper, and cloth. Among the articles so produced are armature



discs, large pieced tinware, boiler covers and bottoms, stove-boards, coal-hod bodies, stove pipe elbows, sections of buckets and tanks. This press is also used with a row of gang dies for punching sheets for playing cards, perforated metals, or other materials.

THE Navy Department has directed that the collier Marcellus and U. S. S. Massachusetts be fitted with the conveyor for coaling vessels at sea designed by the Lidgerwood Mfg. Co., so that a trial of the device can be made outside Sandy Hook. The Marcellus has already been equipped, and tests made with the vessel docked at the Brooklyn Navy Yard have shown as far as conditions would admit the entire practicability of the apparatus. The trials at sea will be made within a week or so, and it is expected will last several days, during which the capacity and limitations of the device will be thoroughly tested. The quick and safe coaling of vessels at sea has troubled the nations of the globe and occupied the attention of experts on the subject for years, and the result of the test will be awaited with unusual interest. If the conveyor proves able to do what the manufacturers and their friends confidently expect it will, the Lidgerwood Mfg. Co. will have solved a problem of vast importance not only to the Navy of the United States, but to the navies of the entire world.

The building of a third Pioneer furnace at Thomas, Ala., is proposed by the Republic Iron & Steel Co.

AN ECONOMICAL GAS ENGINE PLANT.

In our issue of April 14, 1899, we described the coal and ash handling plants which had just been installed at the Jersey City yard of the Erie Railroad. It may be remembered that the machinery in these plants was driven by gas engines working with illuminating gas. Since then there have been installed two Taylor gas producers about 1,800 feet from these plants. These producers now supply gas for these two engines and also for five others used every day. This installation is interesting in many ways, but more especially because it has been shown from the working of this producer plant that where the right kind of fuel is available, power from producer gas used directly in gas engines costs about one-half as much as the same amount of power produced by a good steam engine and boiler and at about the same first cost. The producer plant develops about 12,102 B. t. u. per pound of buckwheat coal. The guarantee was for 10,000 on gas having 125 B. t. u. per cubic foot. The tests show that 1 i. h. p. can be developed from this plant on 1.03 pounds of coal per hour, whereas the guarantee was for 1¼ pounds.

The brick building containing the producers is divided by a wall and in the engine room are two No. 12 and two No. 11 Otto engines, each of the former of which develops 90 h. p. and the latter 45 h. p. when working with producer gas having 125 heat units per cubic feet. The 90 h. p. engines are connected up so that either can be used to drive a 450 16 c. p. incandescent lamp machine or a 1,120 2 000 c. p. arc machine The 45 h. p. machines run the coal elevator in the producer plant, one Ingersoll-Sergeant compressor, two Pintsch gas compressors, the pump for salt water for cooling the gas engine cylinders during the summer, and the automatic feed on the producers. The two 400 h. p. Climax boilers in the brick building containing the producer machinery supply during the winter steam for warming the buildings and coaches in the yard and for the producers. During the summer a small auxiliary boiler is used to supply steam to the producers and for working the pump which takes salt water from the river to cool the cylinders of the gas engines. In the winter the cylinders are cooled by city water which passes into a tank from which it is pumped into the boilers.

The producer plant has an estimated capacity of 471.4 h. p. and R. D. Wood & Co. claim it will produce 500 h. p. Before the 8-inch pipe was laid this plant produced gas for engines generating about 270 h. p. A part of the 201 h. p., which the plant is capable of producing above the 270 h. p. but which until very recently was not used, now runs the engines of the ash and coal handling plants (the former being a 19 h. p. and the latter a 36 h. p. engine) and also a 19 h. p. engine in the machine shop. To carry the gas from the producer plant to these engines about 1,800 feet of 8-inch pipe was required.

The total estimated annual saving for these three engines, due to the use of producer instead of illuminating gas, was $2,024 when using buckwheat coal at the producer plant. The cost of running the three engines with illuminating gas was $16.80 a day; with producer gas $1.40.

Tests were made June 10 last to determine the capacity of this producer plant and the actual output of one of the engines rated at 90 h. p. The engine test lasted 30 minutes. The cubic feet of gas used during this time was 2,417.455; pressure of the gas in the gasometer, 2½ inches of water, and the calorific power of the gas per cubic foot, 136,273. The following was determined from some of the indicator cards:

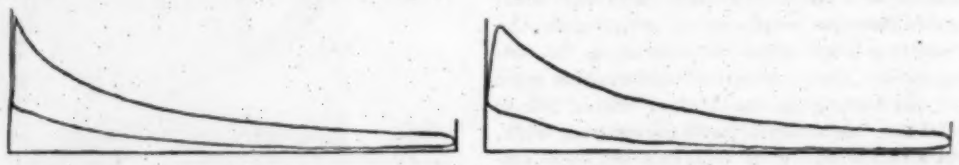
No. of Card.	M. E. P.	H. P.
10 (lower cylinder.)	54.54	49.163
11 " "	54.944	51.858
12 " "	57.347	52.913
13 " "	54.55	54.02
14 " "	60.80	55.45

Cards Nos. 9 and 15, both taken from the lower cylinder, are shown herewith. The average h. p. for one cyliner from these and other cards was found to be .25186. The cubic feet of gas per h. p. per hour was (2,417.455×2)÷52.186=92.6. The h. p. of the engine (two cylinders) equals 104.372. On the basis of the 30-minute test the makers considered it safe to guaratee 52.186 h. p. with 92.6 cubic feet of gas per h. p. per hour, 21,831.6 (cubic feet of gas generated per hour) ÷92.6 =235.7=h. p. generated per hour by one of the producers with bird's-eye coal.

The test of the plant was made during the past summer. The test was begun by placing a known quantity of coal in the hopper over the producer. The thickness of the coal bed in the producer was noted and the gasometer was emptied, and as soon as the weighed coal was fed into the producer the test was begun. A simple device was used to take the place of the meter so that the quantity of coal produced could be accurately determined, it being impossible to obtain a meter that would do the work satisfactorily. The producer was shut off and the safety valve on top of the gasometer opened, allowing the gas to escape: after it had emptied the readings from the scales were again taken in order to determine the quantity of gas made and the time noted. As all the gas could not be measured at the time of the test, one of the engines being in operation, a proper allowance was made for the gas thus used. While the test was being made a chemist took samples which show on analyses the following results:

C O (carbonic acid)	8.2 Per Cent
C (oxygen)	0.8 " "
C O (carbonic oxide)	19.4 " "
H (hydrogen)	16.6 " "
C H (marsh gas)	2.8 " "
N (nitrogen by difference)	52.8 " "

The calorific power per cubic foot figures to 142.94. The B. t. u. generated per hour were found on calculation to be 3,120,827.22 and the cubic feet of gas generated per hour, 21,831.6.—[Railroad Gazette.



Card No. 9, Spring 202, Rev. 164. *Card No. 15, Revolutions 166.*

CARDS FROM LOWER CYLINDER OF 90 H. P. OTTO GAS ENGINE AT JERSEY CITY.

Lackawannar Iron & Steel Co.'s Buffalo Plant.

A meeting of the stockholders of the Lackawanna Iron & Steel Co. will be held at Scranton, Pa., on Dec. 29, to invote on a proposition to increase the capital stock of the company from $3,500,000 to $25,000,000. This is one of the steps in the direction of establishing the large steel rail and billet plant at Buffalo, plans for which have been under way for more than six months. The land was purchased in the spring, as noted in these columns, more than $1,000,000 being paid for it.

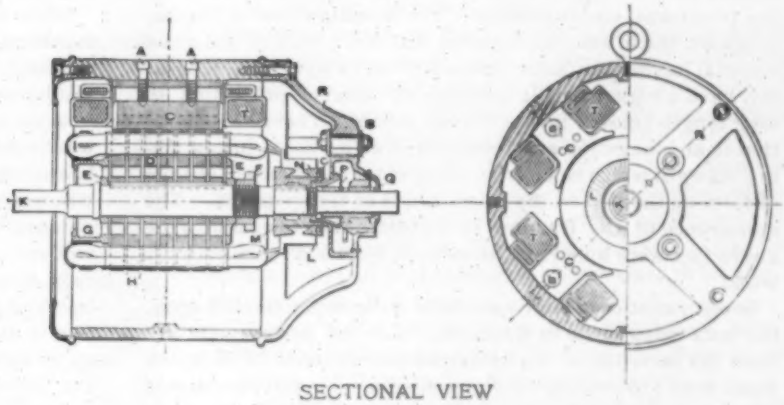
At a recent meeting of the State land board at Albany, N. Y., an application was made by John J. Albright, of Buffalo, representing the Lackawanna interest, for a grant of 50 acres of land under water at Stony Point, near Buffalo, abutting the site on which the proposed plant is to be erected. This application the state board granted. The grant is made for dockage purposes.

SENATOR M. A. Hanna, one of the authors of the Hanna-Payne bill, in a recent speech devoted largely to advocacy of the shipping measure, said: "The large industrial organizations have lessened the handicap against American products by establishing branches in European countries, and reducing the cost of manufacture. The time is now ripe for the government to wipe out the handicap by encouraging the building of American steamship lines to take care of all American products. The subsidy provided by this bill is limited to $5,000,000 a year. Every year American producers have been putting over $200,000,000 into the pockets of foreign steamship owners. We have been the producers, but they have been the distributers. The subsidy the government would pay would not cover more than a fraction of the fuel bills of the American ships which would be built if this bill were passed."

MARINE GENERATING SET.

The combination illustrated below consists of a Bullock type N. I. generator direct connected to a Forbes marine engine. It is designed to fill the requirements of marine work, which are that small space be occupied and that unusual capacity, speed and weight considered, be furnished, with entire reliability.

The engine cylinder is 5x5, and is made for the high pressures of modern marine practice. It is supported upon three hollow steel legs which are rigidly fastened to a sub-base common to both engine and generator. To two of these supports the cross-head guide is securely bolted. Means are provided to adjustfor wear of the cross-head shoe and guide and in the main bearings. A system of sight feed lubricators is installed upon the side of the cylinder with copper tubes leading to all of the wearing surfaces of the engine. A small balance wheel is provided and assists in the regulation of the engine speed. The governor, which is installed on the outer end of the shaft, is of the inertia-centrifugal type and maintains a speed between no load and all load limits of less than two per cent variation. The valve is of the cylindrical balanced type. The generator, like the engine, is very compact. The yoke is a steel casting of the conventional circular form having inwardly projecting pole pieces of laminated soft steel. Each pole is bolted to the frame by two bolts "A-A," the centrally located rivet "B," of the laminated pole "C," being tapped and serving as a nut for the bolts. The armature core "D" is built up of laminated soft steel mounted directly upon the shaft and held firmly together by



SECTIONAL VIEW

BULLOCK TYPE "N-I" GENERATOR

iron end plates "E" and nuts " F" as shown, one end plate resting against shoulder "G." Ventilating slots "H" perpendicular to the shaft provide perfect means of ventilation. The windings "I" are machine formed and hot pressed and are held in place by steel wire bands wound in slots, making a flush finish with the outside of the laminated core. The armature shaft rests in a phosphor bronze bearing at the outer end and is key-seated in the hub of the engine fly wheel which is of extra width and provided for receiving the end "K." The commutator bars, shown at "L," are held together by the sleeve "M," ring "N," and nut "O," the oil shield "P" prevents oil from finding its way from bearing "Q" into the armature. The bearing "Q" is of the self-oiling type, as shown. The end housing "R" securely bolted to the frame, carries the brush studs "S." The field coils "T" are machine wound and thoroughly insulated, and are slipped over the poles before the latter are bolted into position.

The engine operates at 600 r. p. m. and at this speed the capacity of the generator is 5 k. w. at 115 volts pressure. The particular set shown is now installed upon the steamer "Aberdeen," a vessel recently built for the Pacific coast trade. The manufacturers, the Bullock Electric Mfg. Co., Cincinnati, have issued bulletin No. 7534 showing other engine type generators.

THERE are important iron mines far to the north in Sweden whose present outlet is by a short rail route, whence the sailing route to England is somewhat circuitous. But the mines are not very distant from the Norwegian coast on the German Ocean; and Norway is about to build a railroad to give the ore an outlet in that direction. It will be over a difficult country, with many tunnels; and very little traffic except ore can be hoped for. The company owning the mines has made a contract by which it is to pay a certain interest on the cost of the road and the working expenses of the ore traffic. It will also construct the apparatus for discharging the cars directly into ships at the Norwegian port (Narvik, on the Ojoten Fiord) "on the American plan," by which it is hoped to load 1,000 tons in an hour. The railroad, on its part, will carry 1,200,000 tons of ore without further charge. But it is expected that 3,000,000 tons per year will be forwarded. Only 25 miles of the road will be in Norway.—[Railroad Gazette.

Cars Ordered in October, 33,023.

In our news columns during October we noted orders for 33,023 cars of all kinds. Of this number 19,418 were box, stock, furniture and refrigerator cars; 10,781 were gondola and coal cars; 1,700 were steel cars, 810 were flat cars and 314 were passenger and street railroad cars, 100 of the latter being ordered for export. Of the 43,023 cars, about 1,700 are to built by railroads at their own shops. Orders for 323 locomotives of all kinds were also noted, of which about 38 were for export. The division of types of the 323 locomotives was approximately: 242 freight locomotives, 46 passenger and 35 switching locomotives. Nearly 100 more locomotives were ordered than in September, while about three times as many cars were ordered in October as were noted in September. The October orders amount to 2⅓ times as many as were ordered in August, although the record for that month was a large one. The cars ordered during October almost equal in number those ordered in June, July, August and September combined. Some of the large orders placed in October have been deferred for many weeks on account of high prices.—[Railroad Gazette.

Large Demand for Oil-Burning Furnaces.

W. S. Rockwell & Co., the New York furnace engineers, are very busy installing their improved metal working furnaces. They have orders on hand that will keep their entire force busy until Feb. 1, 1900. Among the recent contracts executed are furnaces for Waterbury Rope Co., Brooklyn, N. Y.; Scovill Mfg. Co., Waterbury Conn.; Deere & Co., Moline, Ill.; and U. S. Navy Yard, Brooklyn, N. Y.; also the Waclark Wire Co., Elizabeth, N. J. Owing to the recent advance in the price of fuel oil, Rockwell & Co., are advising their customers to use other fuels, especially on large work, and most of the large contracts they have on hand are for furnaces to use coal and coke as fuel.

On Nov. 30 application is to be made for a charter for the Steel Car Forge Co., Pittsburg, with $200,000 capital stock, the incorporators to be Henry Oliver Evans, John W. Chalfant, Jr., James S. Crawford, James H. Fraser, and A. E. Boyd. The company will manufacture forgings, especially for car building.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

The Fracture of Broken Test Pieces.—[*Baumaterialienkunde*, 6-7.]—Prof. Reudloff, of Charlottenburg, discusses the appearance of broken test pieces in an extended illustrated article. It is customary to describe the fracture appearance, in reporting on a test, as a help in judging the actual figures obtained. Thus we have a granular and a fibrous iron. The service value of a fibrous low carbon steel would lead us to expect more from it for continuous use than from a similar material which breaks granular and more or less lustrous. Irregularity in fracture may be charged to lack of homogeneity in the stock. Again it must not be forgotten that the real nature of a material is not always shown by the appearance of its fracture. Several instances are given. Thus Tuelff states that two wrought iron bars clamped parallel with each other and loaded at the same time will break, one after the other, the first with a fibros fracture, the other with a granular. The first bar will have broken after stretching to its full limit of endurance, while the second receives a sudden load, complicated with bending stresses, the sum total of which go far beyond its endurance and hence it snaps suddenly, a case, by the way, parallel to the well known crystalline fracture of the best grade of stay bolt iron broken in a boiler explosion. Haedicke has observed that bar iron previously notched and then broken off by the drop hammer will show a granular structure. The change from fibrous to granular conditions are the result of forces acting far beyond the elastic limit of the specimen. These examples will serve to show that the appearance of a fractured test piece is largely due to external circumstances. The investigations of Barba, Kirkaldy, Bach, etc., have shown that test pieces of the same material having the same diameter, but varying in length, will have a higher tensile strength in inverse proportion to their length below 1 inch between heads. There is opposition to an elongation and reduction of area, due to forces acting outward which come from the greater resistance to change of form on the part of the larger heads of the specimen. The appearance of the fracture in the tests made to establish the above fact were noted and form the subject of Prof. Rudeloff's work.

Seven varieties of test specimens were experimented upon, the tests being made in duplicate. All the pieces were cut from the same bar of 1.4-inch open-hearth steel. The specimens were grooved out of the same diameter and the lengths of the turned sections were .4, .8, 1.2, 1.6 and 2 inches long respectively. Besides there were two specimens with a rounded and a V groove. A table of results is given: The visible elastic limit is not affected in the specimens until the length gets below .4 inch. Where the length is zero, that is where the groove is a simple V turned in, the results are 55 per cent, and where the groove was rounded 28 per cent, higher than the mean value of all the other tests with the groove between .4 and 2.0 inches in length. The ultimate strength rises after the length of the turned portion drops below 1.2-inch. In actual figures it is 76,500 pounds per square inch with a length of 1.6 to 2-inch; 1 per cent higher with 12.-inch; 2 per cent with .8 inch, 8 per cent with .4-inch, 38 per cent with a rounded groove and 31 per cent for the sharp V groove. The reduction of the area is 1.7 per cent less for the 1.6-inch piece (compared with the 2-inch); 4.2 per cent for the 1 2-inch; 5.2 per cent for the .8 inch; 15.7 per cent for the .4-inch; 35 6 per cent for the rounded groove and 85.5 per cent for the sharp V grooved specimen. One of the sets having been made on an autographic machine, the curves were available for discussion and furnished above figures.

The appearance of the fractures were all nearly alike in the case of the specimens .4-inch and over in length. They were cup-shaped and with a fibrous, velvety appearance. In the case of the groove samples, the fractures were flat, lustrous and finely granular. It was seen, therefore, that the appearance of the fracture depended upon the shape of the piece in this series of experiments. The reason for this is doubtless found in the distribution of the pulling forces throughout the cross section.

What happens during the pulling of a test piece Prof. Rudeloff deduces from the following theorems: The constituents of an iron are grains more or less elongated depending upon its production and treatment. These grains vary in strength and are held together by molcular attraction. The change in form taking place within the elastic limit of the piece depends upon the changes produced in these constituents. Increase the load beyond the elastic limit and the sliding of the constituents over one another will result. The load necessary to do this depends upon the elastic limit of the grains themselves and the frictional resistance between them, this in turn depending upon the cohesive forces and shape of the constituents. The elongation of the constituents means a clinching together on their part with increased resistance to sliding and a greater cohesion. Hence the greater strength observable in a test piece after it commences to flow. Increase the load still further and the constituents of the test piece are stretched rapidly and are finally separated. If the elongation was greater the separation will show the ends of the constituents of the piece as fine pointed fibres and a velvety appearance is the consequence. If the elongation was small there will be little change in these constituents and the fracture will appear granular. To look at this still closer we can suppose a test piece to consist of a bundle of parallel closely fitting rods tightly fastened at the ends. Pull this bundle and each rod will elongate and be reduced in area of cross section, this is supposing there were no cohesion sideways. The result should be a series of cracks parallel to the bar, for with the ends fixed and the rods getting smaller in section spaces will appear between them. In material cut from a rail which showed unsound spots this was actually the case, showing that in rolling the flaws had prevented the welding and only a pressing together had taken place.

When the material is sound our supposition of separate independent rods will not hold, for the cohesive force must be reckoned with. Now in looking at each rod separately it will be seen that its weakest part may be adjoining the weakest part of the next rod, or in other words some flaw or weak spot affects a great portion of the whole cross section, and hence the elongation otherwise liable to take place anywhere, will begin at that flaw or weak spot. Again, the rods may be all equally strong except at one point each, and this point will vary in position with the different rods. Then again, the rods may vary in strength throughout their length. This last condition will mean differences in elongation and reduction in area throughout the test piece and the result is a wavy surface. The cohesion between the separate rods in the bundle means that with good material they will not separate, and hence if reduction in area takes place in a number of them at the same spot there will be a marked contraction in the test piece. Now a study of this contraction will show that the outer layers in sinking in really stretch much longer than the inner ones and hence would seem to have been loaded much heavier. This is not the case, however, for if so the greater elongation of the surface fibres should cause the test piece to break outside first. As a matter of fact the break begins in the middle, the surface going last, and the explanation must be looked for in the compression of the outer layers upon the inner, retarding their free play and adding stresses beyond their ultimate strength. The complete elongation of the material is therefore really that of the surface layer, and the heaviest strains are borne by the center.

A further item which must be considered is the fact that during the test there is a flow of material so that when the elongation begins the particular constituents of a given cross section do not remain the same. When a reduction of area takes place and the forces compressing the center become stronger, the flow of new material from above along the surface to some extent counteracts them and there is a tendency to balance effects. The strains due to sliding friction are, however, increased and have a great effect upon the ultimate breaking strength of the test piece. It is this difference in the stress upon the center and surface which gives the characteristic appearance of the fracture. With the strains fairly equal the flow of material along the surface is not great and hence the break beginning at the center will travel perpendicular to the axis of the piece. A sudden fracture means a granular structure, while a slow one looks velvety. When the strains above mentioned are unequal the break will be

uneven, some particles being torn quickly will appear brilliant and others pulling slowly are fibrous. In breaking at the center the fracture will continue outward perpendicular to the axis as long as the compressive strains of the surface are not too great—the moment these come into play in excess the direction of the fracture changes and we get a cup-shaped break. The processes above described have special reference to materials which stretch considerably, and suffer great contraction before breaking. Where, however, the particles of the piece have a greater resistance to stretching than adhesion to each other, there is only an elastic stretching, little reduction in area, and the break is clean and granular in structure, either coarse or fine, depending upon the size of the original grains.

THE WEEK IN IRON AND STEEL STOCKS.

Denison, Prior & Co., Garfield Bldg., Cleveland, say in their weekly letter on iron and steel stocks: "The past week has witnessed a bull market of some magnitude. Money has ruled at fairly fancy rates, yet stocks have advanced. The advance was not a uniform one, however, and the markets while bullish were more or less spotty. Keene is said to have covered a considerable portion of his short interest in the common shares of the steel combinations and with the exception of the common issue of the American Steel & Wire Co. sentiment seems to favor further advances. Reports of earnings of the steel companies run into fabulous figures. The Federal Steel Co. is mentioned as earning at the rate of $20,000,000 per annum, which amount is sufficient justification of the dividend stories that are having such free circulation. Bull movements in Colorado Fuel & Iron and Tennessee Coal & Iron are again spoken of, and the present action of these securities would indicate that the pools behind them are lending excellent support to their specialties.

"Our faith is still pinned to the preferred issues of such companies as the National Steel, the Federal Steel and the American Steel & Wire Co., and we recommend their purchase on every recession, fully believing that they will pay a handsome return on the investment. The future course of the general market now hinges on money and politics, both of which are to a greater or less extent uncertain quantities."

The following table shows the fluctuations in iron and steel stocks in the week ending with Monday, Nov. 6:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy.....	17	17⅝	16⅞	17½	21⅞	May 25	15	June 15
Am. Car & Fdy pr.	63½	63¾	62	63	68¾	Sept. 7	56¾	June 16
Am. Steel & Wire..	48⅞	50	48½	47¾	72	May 4	45	Feb. 8
AmSteel & Wire pr	94	94½	93	94	106¾	Mar. 13	92½	Feb. 8
Am. Steel Hoop.....	42¾	43⅞	42	43	45½	Sept. 25	24	May 24
Am. Steel Hoop pr	82¾	83	82	82¼	86¼	Sept. 14	70	May 13
Am. Tin Plate,.....	34	35	31½	33	52¾	April 4	31½	Oct. 31
Am. Tin Plate pr..	82½	84	82½	83	99⅜	Feb. 8	81	June 1
Col. Fuel & Iron...	56¾	57¾	54	55⅞	64	Sept 11	30½	Feb. 8
Federal Steel.....	55⅜	60¾	54¼	58¾	75	Apr. 3	46⅝	Feb. 8
Federal Steel pr....	79	81⅞	78⅛	80⅜	93⅜	April 3	72½	May 13
National Steel.....	49⅞	50½	47¾	48¾	63	April 24	43¾	June 2
National Steel pr..	93¾	94½	93¾	94½	99⅜	Aug. 11	85	May 15
Pressed Steel Car..	59	59¾	58	58	61	Aug. 14	44¾	June 1
PressedSteelCar pr	89½	89¾	89	89	91	Sept. 7	78	May 25
Republic Steel.....	25¾	26⅞	24⅜	24½	33⅞	Sept. 6	22¼	Aug. 26
Republic Steel pr..	70	71	69	69	79	Aug. 29	69	Nov. 6
Tenn. Coal & Iron	119	119¾	116⅝	118	126	Sept 11	36	Jan. 14

The Foundrymen's Association.

At the annual meeting of the Foundrymen's Association at the Manufacturers' Club, Philadelphia, Wednesday evening, Nov. 1, 30 members were present. The following were elected officers for the coming year: President, Thomas F. Rankin; vice-president, James O. Stirling, Wilmington; secretary, Howard Evans; treasurer, Josiah Thompson; executive committee, A. C. Pessano, S. G. Flagg, Jr., Dr. E. E. Brown, John Glover, William Hanson. The association discussed a proposition to establish a "bureau of credits" as an organization within the general one. The suggestion grew out of the losses suffered by foundrymen from unscrupulous customers, who after running up a bill for castings, transfer their patterns to other shops and leave the old indebtedness unpaid. There was a sentiment favorable to the proposed bureau, one of its functions being the bulletining of names of bad debtors for the information of members.

The Republic Iron & Steel Co. is contemplating the removal of its plant at Muscatine, Ia., to Youngstown, O.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Grand Rapids Malleable Co., of Grand Rapids, Mich., is building a five-furnace plant for the production of malleable castings. Special attention will be paid to the manufacture of carriage and wagon hardware, though the company contemplates also cultivating actively the general malleable trade. The new plant will be equipped with the most modern appliances devised for the manufacture of malleable castings. All the power will be electrically transmitted. The annealing room will be equipped with a traveling crane and every department will be supplied with the best labor-saving devices. Edward Lowe is president; Henry Idema, vice-president; I. Preston Rice, manager; Harvey J. Hollister, treasurer, and Douglas M. Ray, secretary.

At Ashtabula, O., the International Range Mfg. Co. has been organized, capitalized at $50,000. The company has purchased the London Rubber Co.'s plant and will soon begin the manufacture of stoves. G. W. Kohlmetz, for several years secretary of the Gobeille Pattern Co., of Cleveland, is at the head of the company. The other holders are residents of Ashtabula.

K. J. Todd, Bluffton Ga., is in the market for 20x14-inch lathe, shaper, planer and other tools for repair shop.

Chas. L. Todd, Richmond, Va., is in the market for second-hand engine and boiler, 100 h. p.; also for gas or gasoline engine.

The Metal Specialty Co. has been incorporated at Chicago, with capital stock of $6,000, to manufacture metal specialties and articles. The incorporators are George Trubel, Alexander McLean, Jr., and D. B. Gann.

The steel works of the Lima (O.) Locomotive & Machine Co. have been purchased by L. G. Neeley and J. D. S. Neeley. The works have been inactive for over a year but will be operated very soon. The new owners have incorporated the Lima Steel Casting Co., capital $40,000.

The New Castle, Ind., and Richmond, Ind., men owning the shovel works at New Castle have organized under the name of the American Shovel Co., whose officers are: G. W. Miller, president; W. C. Hess, vice-president; Chas. Mouch, secretary and general manager; Jonas Gaar, treasurer. The paid-up capital is $50,000.

Relative to the consolidation of a number of steel companies into the Atlantic Iron & Steel Co., ex-Senator Charles A. Porter, of Philadelphia, states the Birdsboro Iron & Steel Co. will not be taken into the deal, although it was intended to do so. Owing to this decision the plan will be modified and will be as follows: The capital stock of the new organization will consist of $10,000,000. Five million in preferred stock entitled to a preferential dividend of 7 per cent per annum, and $5,000,000 common stock. The common and preferred stock will each be $5 par.

The Atlantic Furnace Co., of Camden, N. J., has filed articles of incorporation to manufacture iron and steel. The capital stock is $500,000 and the amount paid in is $3,000. The incorporators are Chester R. Baird, Harold F. Cheney and John W. Cheney.

The Imperial Iron Co., Trenton, N. J., has been incorporated with a capital stock of $7,000,000, one-half to be 7 per cent preferred stock. The incorporators are W. J. Haerther, F. H. Lamb, F. D. Graham, W. H. Ramsay and George H. B. Martin.

The James F. Powers Foundry Co., of Cecil County, Md., has been incorporated; capital stock is $20,000. The company will manufacture castings.

Among concerns recently incorporated in New Jersey are: The Iron Gate Furnace Co. (Camden, N. J.,) to manufacture iron and steel; capital stock, $100,000; paid in $3,000. The Virginia Rolling Mill Co. (Camden, N. J.,), to conduct a general rolling mill business; capital stock, $200,000; paid in $3,000.

New Construction:—

The Schuylkill Iron Steel Co. will enlarge its plant by a one-story structure, 218x80 feet. Cost will be $20,000.

The A. Y. McDonald-Morrison Mfg. Co., of Dubuque, Iowa,

has let the contract for a building 200x140 feet. The building now occupied by the company will be used as a storage house.

The Keystone Structural Works, of Royersford, Pa., will build a machine shop and tempering room, 40x100 feet in size, and also an annex to the main building.

At the plant of the American Ax & Tool Co., at Beaver Falls, Pa., a large addition is being erected in which 24 additional grindstones will be set up. It is intended to increase the output of the plant.

The Standard Steel Co., whose plant is located at Burnham, Pa., has decided to enlarge the works. The Logan Iron & Steel Co., an industry located near that of the Standard Steel Works, is making additions which will increase the capacity of the mills.

The National Tube Co., owners of the Riverside Iron Works, at Wheeling, W. Va., are contemplating extensive improvements. A 500-ton blast furnace is to be one item. The work is contingent on reasonable terms for adjoining property.

The Keeler Brass Co., of Middleville, Mich., has outgrown its foundry and has located another in a nearby warehouse. It is expected that a new foundry building will be erected in the spring.

The new buildings of the Adams Foundry Co., Dubuque, Ia., will be 100x60 feet, and 200x60 feet, of brick and one story.

Work has begun on the buildings for the plant of the Maryland Car Wheel Works, at Baltimore. Chicago capital is behind the enterprise, and the company has a capital stock of $75,000. N. S. Boynton, of Chicago, the president of the new concern, has been engaged in the manufacture of car wheels since 1852, and has now a large plant in operation in Birmingham, Ala. The foundations of the Baltimore plant will be of brick and stone, and sides of corrugated iron. There will be a foundry 200x200 feet, machine shop 50x60 feet, blacksmith shop 20x50 feet and an engine house. The works are to commence operation by Jan. 1, 1900.

The Bellaire, O., plant of the National Steel Co. is being improved. A blast furnace will be remodeled and a stock house will be erected.

The Canton (O.) Steel Co. has purchased the old Sherlock Foundry property and will erect a new melting house. There will be two furnaces of the most modern type. A large battery of boilers is being put in place.

The Sandage Steel Skein Works, of South Bend, Ind., is adding another building to its plant. This is the third addition made this year.

The Harriman Land Co., of Harriman, Tenn., principally owned by Chicago and New York capitalists, has plans for two blast furnaces. Besides this the company will erect 200 coke ovens, and the State of Tennessee, whose prison is located near there, will begin in 30 days to build about 350 ovens. The Harriman company announces that it will expend $250,000 in improvements.

Fires and Accidents :—

The plant of the Birmingham Hardware Co., of East Birmingham, Ala., was destroyed by fire Oct. 26. The loss is $25,000 and insurance only $4,500. The fire was caused by spontaneous combustion in the paint room. The company manufactured sad irons, sash weights, grate bars, and other castings. At the time of burning it had orders enough on hand to tax its capacity until Jan. 1. The plant will be rebuilt at once.

The brass foundry of Hartman Bros., at Cincinnati, was damaged by fire, Oct. 31. The loss is several thousand dollars.

The shaft house of the Negaunee mine, Negaunee, Mich., burned Oct. 26. The mine is owned by the American Steel & Wire Co. It is thought the fire was of incendiary origin.

At East Braintree, Mass., fire partly destroyed the Victor Metal & Foundry Co.'s plant Nov. 4, causing a loss of $10,000.

Nearly $400,000, by late estimates, represents the cost of a fire that destroyed the finishing part of the American Steel & Wire Co.'s plant at Waukegan, Ill., Nov. 4 From the wire mill the fire spread rapidly to the galvanizing, cleaning and annealing shops adjoining the main building, then to the copperas house, slightly detached, which was partly destroyed. The warehouses, completed only a few weeks ago, and filled with mill products valued at $100,000, were scorched, but the rolling mill, machine shop and boiler house were untouched. The insurance is about $325,000.

The building at 35 to 43 West Washington st., Chicago, was destroyed by fire Nov. 1, entailing a loss of $98,000. Among the concerns suffering loss were the following: M. McGregor & Co., machinery, $6,000; Becker Bros., electric machinery, $6,000; Simpson Dynamo Co, $6,000; Moser & Wilson, brass foundry, $6,000; E. Reed Burns, electro plating, $4,000. All losses were partly covered by insurance.

Fire and water caused damage to extent of $50,000 to the occupants of the manufacturing building at 88 to 92 Jackson Boulevard, Chicago, Nov. 2. Among the concerns suffering loss were the Heyer Storage Battery Co., the Ostrander-Seymour Co., maker of printers' machinery, Roth Bros. & Co., manufacturers of electric motors and machinery, and the Davis Cream Separator Co. Each of these lost from $5,000 to $7,000, and the losses were all partly covered by insurance.

Fower Equipment and Machine Tools :—

The Bullock Electric Mfg. Co., of Cincinnati, reports 55 orders for the month of October, the machines ranging in size from the smallest to 300 k. w. capacity. A repeat order was received from the Maryland Steel Co. of Sparrows Point, Md., this making the fifth order and being for a 300 k. w. generator and several motors. Orders were received from the London, Eng., *Star*, and St. Petersburg, Russia, "*Novoe Vremja*," two important papers, for the Bullock "teaser" equipment for operating newspaper presses. Two 300 k. w. alternating current generators were shipped to the Wilson Aluminum Co., of Holcombs Rock, W. Va., to be used in the manufacture of ferro-chrome.

The Webster Mfg. Co., of New York, reports the receipt by cable of the acceptance of its figures for the supply of power transmission, elevating and conveying machinery for a large oil plant now in the course of erection by a Portuguese concern in the vicinity of Manaos, Brazil. The contract, which is stated to be worth upwards of $17,000, was awarded in the face of severe English and German competition.

A special train loaded with sugar machinery for the Sandwich Islands left Cleveland last week. The machinery was built by the Kilby Mfg. Co. and is for three sugar refineries of the McKoe Sugar Co., at Kealia, a place in the interior of the Hawaiian Islands. It took a train of 30 freight cars to carry the shipment, and there are six cars yet to go.

The Pittsburg District :—

The addition to the Woods Run plant, Allegheny, of the Pressed Steel Car Co. in Allegheny City, will cost about $200,000. It will be located on the land the purchase of which, from the Baker Chain & Wagon Iron Mfg. Co., was recently mentioned. Plans are now being prepared for the addition, and work will be commenced as soon as possible.

The Pittsburg Steel Foundry Co. made its first cast at its new plant at Glassport, Pa., last week. Erection was started on the plant last May, and the completion in the time is somewhat remarkable, considering that several serious delays occurred. The officers of the company are as follows: Stewart Johnston, formerly of the American Steel & Wire Co., president and general manager; James M. Lockhart, vice president; Augustus Trump, secretary and treasurer; William McKelvey, president of the Atlantic Refining Co.; Wallace H. Rowe, manager of the American Steel & Wire Co., and James J. Donnell, president of the Bank of Pittsburg, directors. The company is capitalized at $250,000.

Chess Bros. & Co., Pittsburg, are figuring on the erection of an open-hearth plant in connection with their tack manufacturing plant at Rankin, Pa.

It is stated that the new tube plant of the Atlantic Tube Co., Pittsburg, being erected at Beaver Falls, Pa., will be completed and put in operation in about two weeks, and that the entire product of the plant has been disposed of for a considerable time.

The Gem Mfg. Co., Pittsburg, will apply for a Pennsylvania charter Nov. 27, the incorporators being William E. Frick, John A. Clark, Edwin S. Fownes, D. A. McCaffrey and W. D. Forsythe.

The Lewis Foundry & Machine Co., of Pittsburg, will soon be ready to begin shipment on some large European contracts. One of the shipments will be of a No. 5 Garrett con-

Cross Section. End View.

"Why, the oil we are getting in our boilers doesen't hurt them a particle—in fact, it is rather good for them." . . . .

A good many engineers have told us this. Perhaps there is something in their conditions which prevents the full dose from getting in—perhaps they clean oftener and more thoroughly than other people.

The "hot-well" water from which marine boilers take their supply would soon cause trouble if it were not for the short runs and frequent cleanings. It should not be a question of relying upon what might be termed the "digestive power" of a boiler, but rather one of making sure that the oil does not go into them, which can be done. Under anything like normal conditions, the **COCHRANE SEPARATORS** will give separation so effective that hundreds of our customers call it perfect separation. Very reliable in operation, very reasonable in price.

We also make the **COCHRANE SEPARATORS** for live steam service. The illustrations presented herewith show different views of our high pressure pattern for horizontal pipe.

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Side Section.

tinuous rod mill of 550 tons capacity, which is to be erected at Westphalia, Germany. Another is a universal mill, which is to be one of the largest in the world, and is to be erected in Australia. The shipments will constitute many carloads of machinery.

The Brown Hoisting & Conveying Co., of Cleveland, has contracted with the Carnegie Steel Co., Ltd., to erect to ore handling machines and storage bins at the Carrie furnaces. The work will be completed this year.

In addition to increasing its pig iron production, the American Steel Hoop Co, will make radical improvements in its Pittsbrug mills recently acquired. The Painter mill and former Lindsay & McCutcheon plant will be overhauled and thoroughly modernized.

Parties largely connected with the Union Boiler Tube Cleaner Co. of Pittsburg, will make application for a Pennsylvania charter for the Union Boiler Cleaning Co., Pittsburg, the incorporators being A. T. Rowand, Jr., Robert T. Russell, Joseph Rowand, W. S. Walsh and Ernest W. Beach, all of Pittsburg. It is understood that it will be the only company of its nature in the world. The patented devices manufactured by the Union Boiler Tube Cleaner Co., will be used.

The Hall Steam Pump Co., of Pittsburg, has just completed the shipment of a large order for air compressors to Valiodostat, Siberia, and is working on an order for the Philadelphia company, to duplicate the large compressors recently built at Moline, Ill. These compressors are the largest in the world. Work is now progressing on an air compressor for London, Eng. The English firm has interests in Australia, and one of the American air compressors was so satisfactory at the Australian plant that a duplicate was ordered for the London plant. A representative of the company is now in Cuba arranging for a series of artesian wells and fittings to be equipped for the government.

The fourth of the historic buildings composing the old Graff-Bennett mill at Millvale has been sold to the Whitaker Iron Co., Wheeling, W. Va., to be used for an extension to the company's plant. These four buildings formed part of the buildings of the Centennial Exposition in Philadelphia in 1776 and at the termination of the exposition were taken down and erected at Millvale, where the mill they covered was kept in operation for a long time. One of the buildings was sold recently to the Park Steel Co., another to the Best Mfg. Co., and another to the Page Woven Wire Fence Co, Monessen, Pa. The buildings were made of iron, and on being taken down showed a surprisingly small amount of rust.

The new fiscal year of the Amalgamated Association of Iron, Steel and Tin Workers began Nov. 1. The only change in the personnel at the main office at Pittsburg was the succession of Stephen Madden, as assistant secretary, by M. F. Tighe. Mr. Madden becomes editor of the *Amalgamated Journal*, a new labor paper recently started by the organization.

The Union Boiler Tube Cleaner Co., of 231 Penn ave., has just completed a contract for cleaning two Hazleton or Porcupine boilers, having over 2,000 tubes, one end of which is welded tight. These tubes were badly scaled and the closed end required a special tool as well as the use of the Union Boiler Tube Cleaner Co.'s own design of flexible shaft. This concern is alone in being fully equipped with machinery, tools and expert operators to do this kind of work.

A large steel frame building has been added to the plant of the A. French Spring Co., Pittsburg, Pa.; also several steel coke bins. The contract was awarded to Wm. B. Scaife & Sons, of Pittsburg, who designed and erected the work.

Chicago District and Northwest:—

The American Hoist and Derrick Works, of St. Paul, Minn., are adding a $10,000 steel casting plant to its equipment. The Tropenas steel process will be used. M. Champailler, of Paris, will superintend the installation of the plant. It is thought the plant will be in operation by Feb 15.

The purchase of the steel plant at West Superior, Minn., the Ironton plant, and the car works at Duluth has been

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Those who have tried Watts know its merits. It is strong, soft and tough. Can be melted alone, mixed with other brands, or used as a scrap carrier.

The Watts furnaces are sold up for this year, but can take care of a limited number of orders for delivery beginning in January. Let us know how much you need and we shall make you the most favorable prices.

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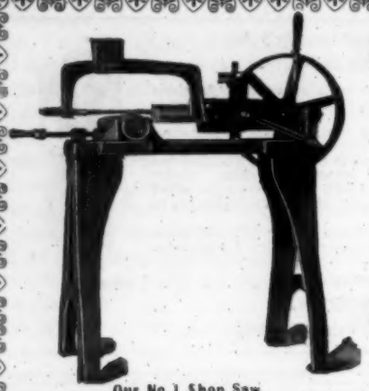

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closed, and they are now the property of John E. Searles, of New York, president of the American Cotton Co., and his associates. The plant at Superior will be made a Bessemer plant and the plant at Ironton will be made an open-hearth steel plant, a number of open-hearth furnaces being put in. The other plants will be utilized for the manufacture of steel plate, structural and bridge steel and wire.

The Belle City Malleable Iron Co., at Belle City, Wis., which recently changed hands, has made F. W. Harvey, of Chicago, president and general manager; T. B. Martin, of Cleveland, superintendent, and J. C. Fortnier, secretary and treasurer.

The Whiting Foundry & Equipment Co., of Harvey, Ill., has begun work on a large addition to its plant.

The Deering Harvester Co. is increasing the height of its foundry at Clyburn and Fullerton aves. 16 feet. The change will cost $20,000. The building is 260x98 feet.

The C. & M. Co. has been incorporated at Chicago, with capital stock of $2,500, to manufacture tools, machinery and mechanical instruments, by S. W. Stiger, C. C. Stilwell and C. C. Bowerstock. The office of the company is at 249 S. Jefferson st.

Thomas C. Wright, of Indiana, is planning to build a plant at Superior, Wis., for the manufacture of castings and machinery.

General Industrial Notes:—

The Ferracute Machine Co., Bridgeton, N. J., is doing a larger business this year than ever in the manufacture of presses, dies, and other sheet metal tools. It has been necessary to have a special night force, so that the works are not idle except Saturday afternoons and Sundays.

The North Lebanon (Pa.) furnace, the largest in Eastern Pennsylvania, was put in blast Nov. 1. It will produce upwards of 300 tons a day.

The Wheeling Corrugating Co. has brought suit against the old Meadow Rolling Mill Co. to recover $5,000. The statement sets forth that in December, 1898, the defendant company sold and agreed to deliver to the plaintiff 1,080 tons of Bessemer annealed sheets. It is alleged that only 80 tons were delivered, and the plaintiff was obliged to purhase the steel at another place at greatly increased prices and that it was compelled to shut down part of its plant by reason of the failure of the defendant to furnish the sheets according to contract.

The new factory of the Fosdick & Holloway Machine Tool Co., at Cumminsville, O., has commenced operations.

The bar mills of the Ohio Falls Iron Works New Albany, Ind., are on for the first time since 1895. Large orders have been received and the mill will be run night and day.

The works of the American Iron & Steel Co., at Philadelphia, are to be enlarged. The puddling mill output will be increased to three times its present capacity, and a new 8-inch rolling mill will be erected.

The Fannie furnace at West Middlesex, Pa., recently turned out 151 tons of Bessemer pig in 24 hours. It is 60x14 feet.

Topeka, Kan., has two active foundries. The Western Foundry & Machine Works manufactures steam engines, mill machinery, etc. The Topeka Foundry turns out stove repairs, machine work, patterns, cut gears and brass work.

The three Hocking Valley furnaces recently purchased by Col. H. A. Marting, in the Hocking Valley, are to be moved to Columbus, O. Col. Marting receives 18⅓ acres of land and $35,000 in freight rebates. The furnaces will be ready for shipment this week. They will be rebuilt to make two stacks.

The Shelby Iron Co., operating a charcoal furnace at Shelby, Ala., has declared a dividend of 5 per cent, payable at the office of W. S. Gurnee & Co., 80 Broadway, New York, on Nov. 15. The company is capitalized at $1,000,000. Last spring a dividend of 8 per cent was paid.

Progress is being made on the new Bessemer steel plant of the Republic Iron & Steel Co., at Youngstown, O., connected with the Brown-Bonnell plant. The first steel erection is up,

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PIG IRON.

If you need any soft iron for quick shipment we can supply it. If you was to contract for next year we can make you fair prices for the best brands in the market.

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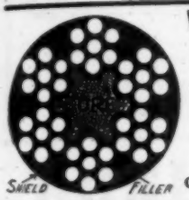

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and the foundations for engines and converters are being built. The first of the machinery from the dismantled plant at Alexandria, Ind., has been received.

German Iron Trade and American Competition.

The Frankfort *Finanzherold* of recent date says: "There are but two reasons why American competition has not hurt our iron industry so far. One is the immense demand for iron in America and the other is the large consumption of iron in Germany. America has within a few years become a manufacturing nation of the first class and competes with us not only in the foreign markets, especially Mexico, South America and Africa, but also in our home markets. Our bicycle industry is complaining over the influx of American bicycles and in other branches of the iron industry the import of American goods is matter for serious thought, not so much for the moment, in view of the immense home demand in America, as for the future. And rightly so." The *Finanzherold* recapitulates the main figures of this year's American exports and adds "The success that America has attained with her products in foreign markets is in no way due to their quality, but to their cheapness, which is one result of the immense creation of trusts and the division of labor, cheapening cost of production. Then there is the remarkable organization of the Americans for spread of information. Consular reports are more designed for use of traders in America than they are with us. They are issued daily and are of much value in the trade circles for which they are intended. The whole system of government is designed to further trade interests."

In the November issue of *Graphite*, the Joseph Dixon Crucible Co.'s monthly publication, J. A. Walker, vice-president of the company, has this on "commercial morality," which is sound and just: "What about the ethics of settling for one's purchases, not as the goods were bought, but in some other exacting way? For instance, one buys goods f. o. b. the seller's depot, and when settling the buyer deducts the freight, saying 'It may go through,' or, 'Other sellers allow freight.' Of course, the seller not getting the remittance can refuse it, but it promises friction in the correspondence. Again one

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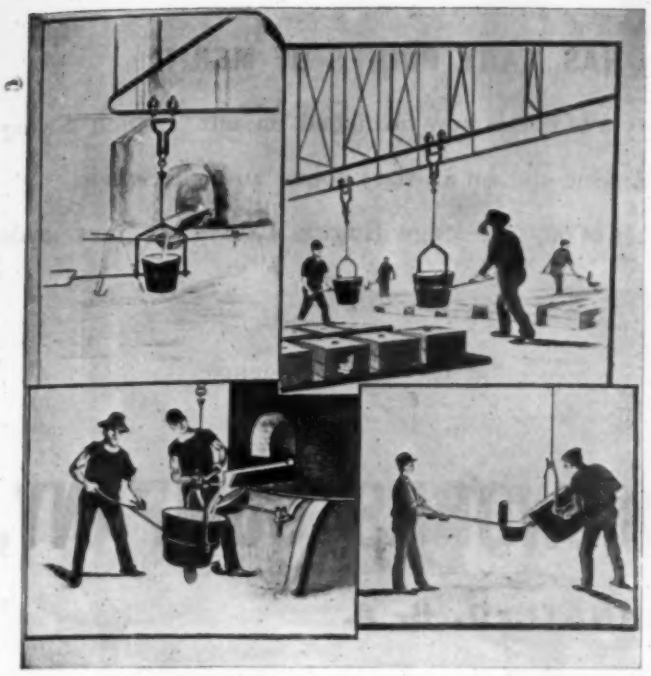

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Carnegie Steel Company, Ltd., Duquesne, Pa.	4	2,400	Double.
Carnegie Steel Company, Ltd., Edgar Thompson	9	3,500	Six.
Carnegie Steel Company, Ltd., Rankin (Carrie)	2	700	Double.
Carnegie Steel Company, Ltd., Pittsburg (Lucy)	2	800	Double.
Struthers Furnace Company, Struthers, O.	1	302	Single.
Laughlin & Co., Ltd., Pittsburg, Pa (Eliza)	5	2,000	Double (2)
Oliver & Snyder Steel Company, Pittsburg, Pa. (Edith)	1	400	Double.
Oliver & Snyder Steel Company, New Castle, Pa. (Rosena)	1	500	Double.
Shenango Valley Steel Company, New Castle, Pa.	2	800	Double.
Bellaire Steel Company. Bellaire, O.	2	700	Double.
Lebanon Furnaces, Lebanon, O.	2	500	Double.
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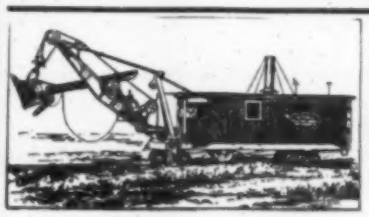

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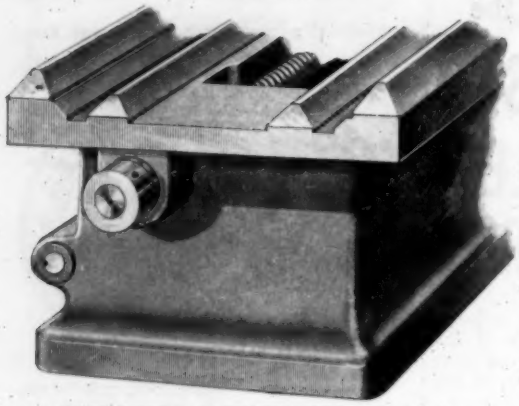

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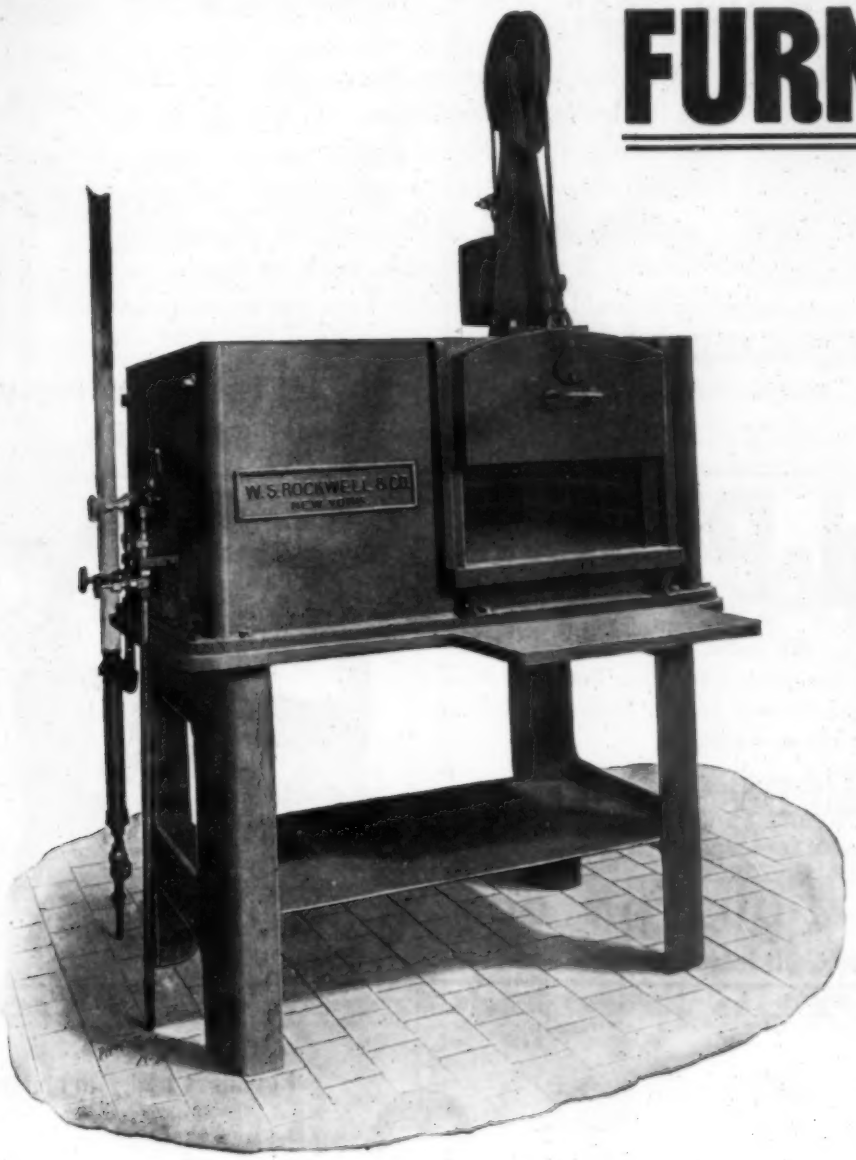

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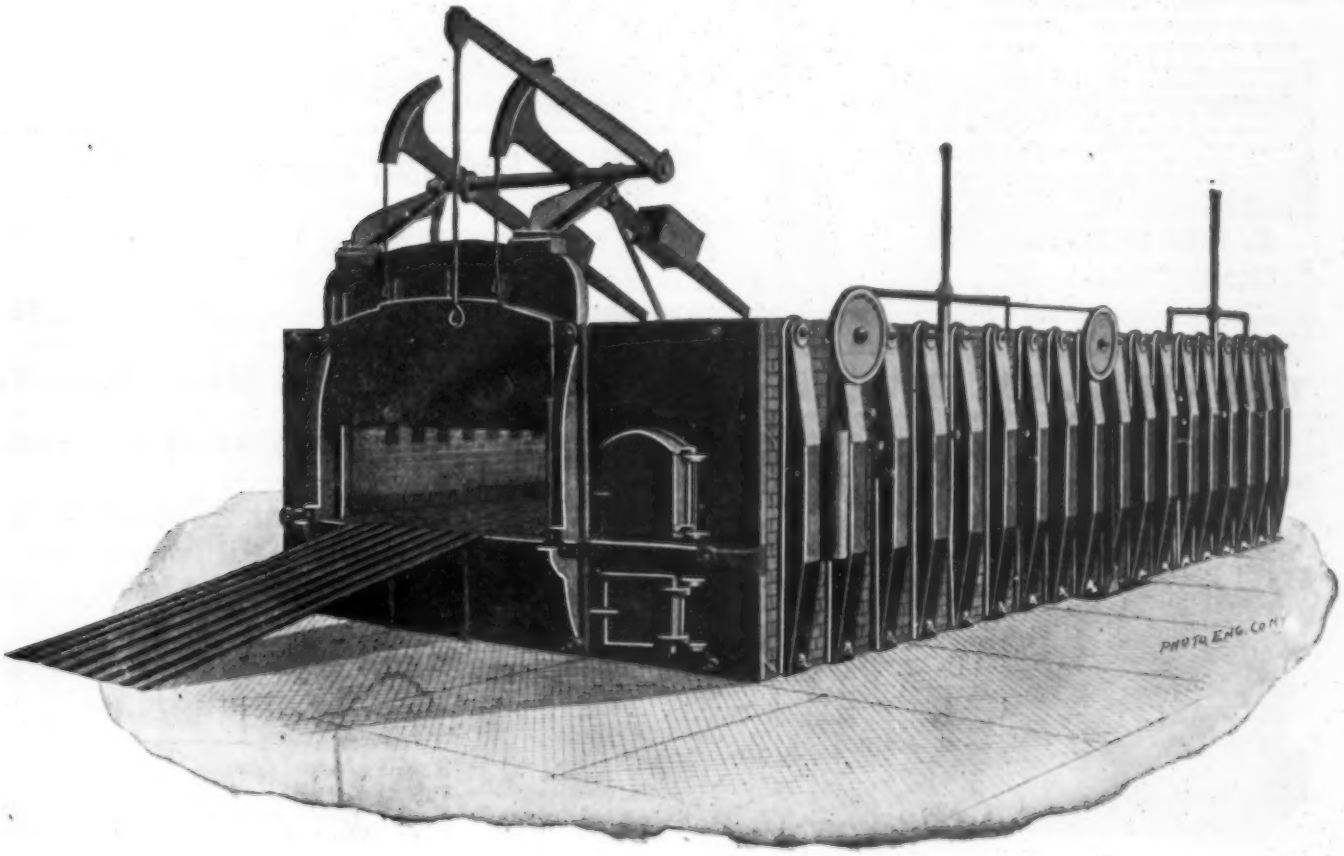

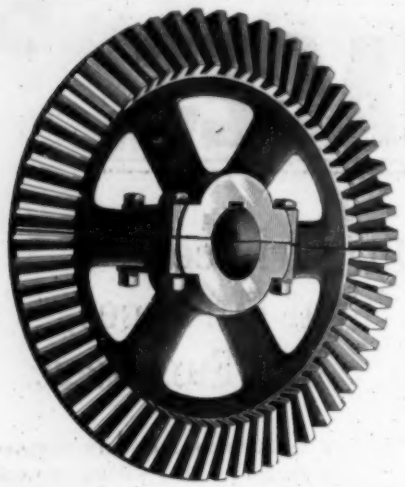

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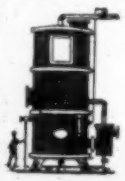

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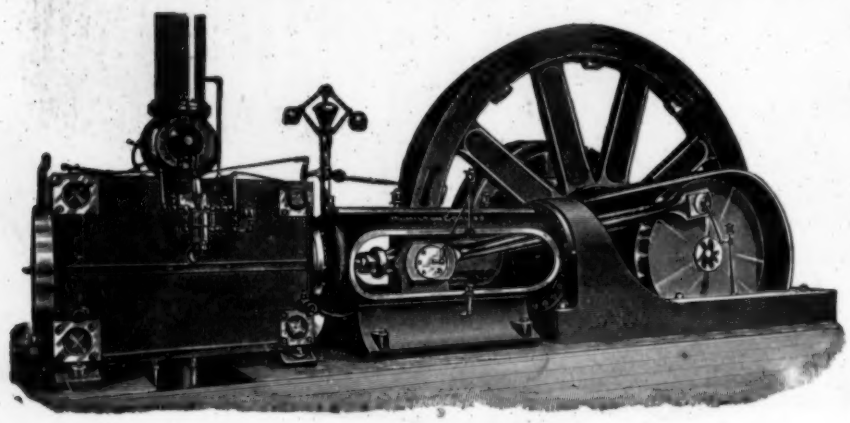

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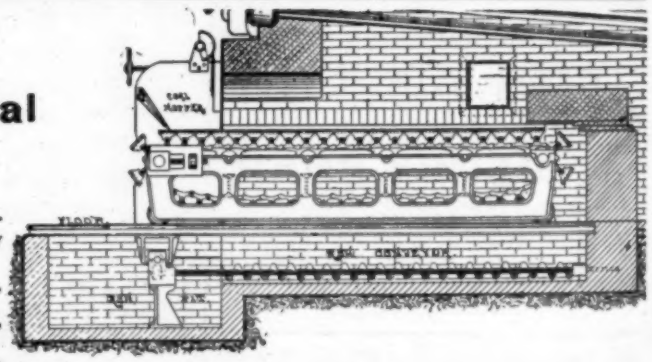

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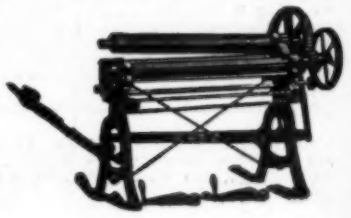

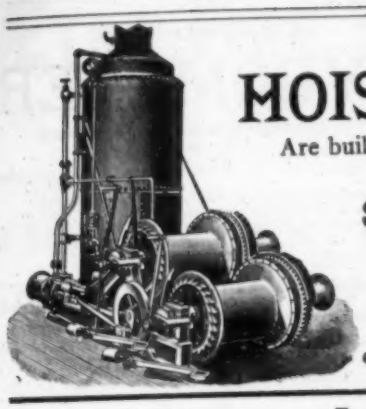

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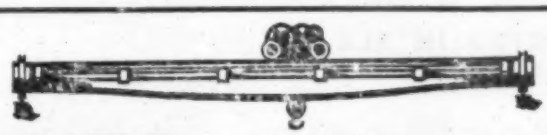

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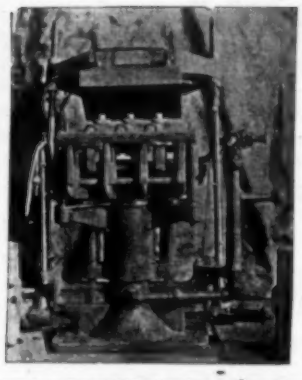

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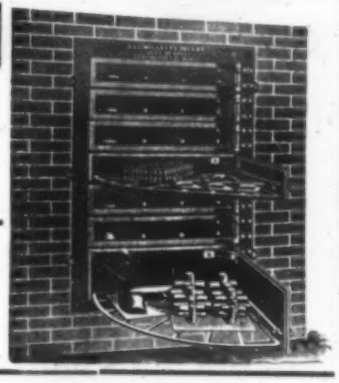

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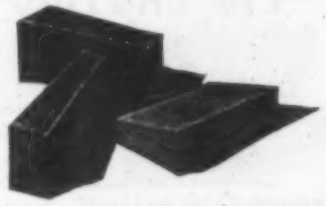

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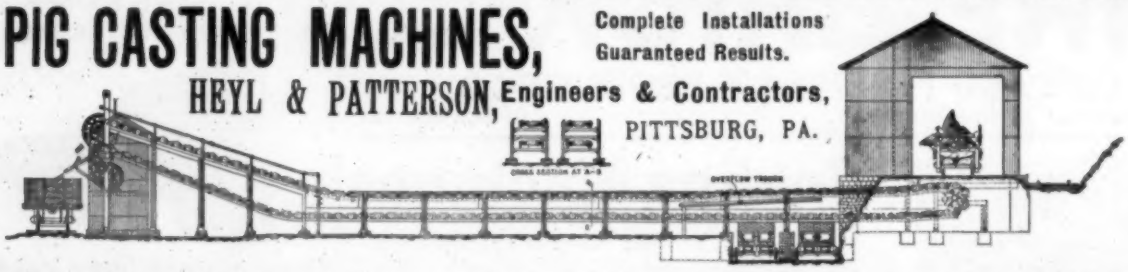

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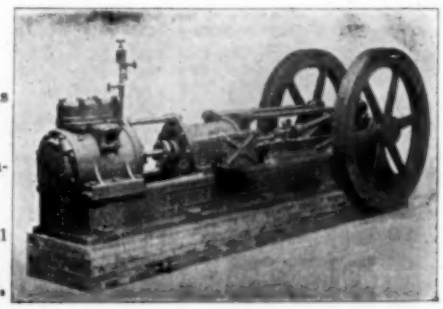

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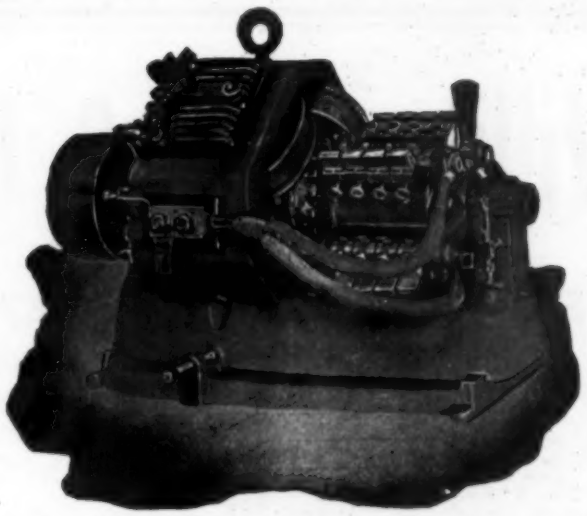

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1 to 1⅞	2.50 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6⅜	2.20 "
6⅝ to 7⅛	2.50 "
¾ to ⅞	.10 "
⅝ to 11-16	.20 "
⅛ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 1-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅜ to 1	1.05 Base
4¼ o 6 x ⅜ to 1	.10 extra
6¼ o 8 x ⅜ to 1	.60 "
8¼ o 10 x ⅜ to 1	.80 "
1⅜ o 4 x 1 1-16 to 1½	.50 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
¾ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
⅛ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. Bevel Edge Shaft Iron 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extr
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "

7-16 to ½ x No. 9 to 3-16.....1.30 extra
7-16 to ½ x Nos. 10, 11 and 12.....1.40
⅝ x No. 9 to 3-16.....1.50
⅝ x Nos. 10, 11 and 12.....1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.....
Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1⅛.....40 extra
½ to 13-16.....50 "
⅝ to 11-16.....60 "
¾ to 9-16.....80 "
⅞ to 7-16.....1.10 "
1 to 9-16 x 3-16.....1.00 "
⅜ to 11-16 x ¼.....1.20 "

Half Oval and Half Round.

2¾ to 3.....60 extra
⅞ to 2.....50 "
¾ to 13-16.....70 "
⅝ to 11-16.....90 "
½ to 9-16.....1.20 "
⅜ to 7-16.....2.50 "
5-16.....3.50 "
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Half Ovals less than ¼ their width in thickness extra price.

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1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base.
		Extras.
1¼ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs.
1 to 1¼,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¼,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45 "
⅝,	Nos. 7, 8, 9 or 3-16"	.55 "
⅝,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-16	" 10, 11, 12 or ¼"	.85 "
½,	" 7, 8, 9 or 3-16"	.95 "
½,	" 10, 11, 12 or ¼"	1.05 "

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.	
7-16 to 3	Nos. 13, 14, 15 and 16.....	1.60 Base
		Extras.
7-16 to 2,	" 17, 18, and 19.....	.05 per 100 lbs
7-16 to 2,	" 20.....	.10 "
7-16 to 2,	" 21.....	.15 "
7-16 to 1¾,	" 22.....	.25 "
½ to 1¾,	" 13, 14 and 15.....	.05 "
½ to 1¾,	" 16, 17 and 18.....	.10 "
1¾ to 1¾,	" 19 and 20.....	per 100 lbs.
1¾ to 1¾,	" 21.....	.20 "
1¾ to 1¾,	" 22.....	.30 "
15-16 and 1,	" 13, 14 and 15.....	"
15-16 and 1,	" 16, 17 and 18.....	.15 "
15-16 and 1,	" 19 and 20.....	.20 "
15-16 and 1,	" 21.....	.25 "
15-16 and 1,	" 23.....	.35 "
⅞,	Nos. 13, 14 and 15.....	.20 "
⅞,	" 16, 17 and 18.....	.25 "
⅞,	" 19 and 20.....	.30 "
⅞,	" 21.....	.35 "
⅞,	" 23.....	.45 "
¾ and 13-16	Nos. 13, 14 and 15.....	.30 "
¾ and 13-16	" 16, 17 and 18.....	.35 "
¾ and 13-16	" 19 and 20.....	.40 "
¾ and 13-16	" 21.....	.45 "
¾ and 13-16	" 23.....	.50 "
¾ and 13-16	" 23.....	.60 "
11-16,	Nos. 13, 14 and 15.....	.35 "
11-16,	" 16, 17 and 18.....	.40 "
11-16,	" 19 and 20.....	.50 "
11-16,	" 21.....	.60 "
11-16,	" 22.....	.70 "
11-16,	" 23.....	.80 "
⅝,	Nos. 13, 14 and 15.....	.40 "
⅝,	" 16, 17 and 18.....	.45 "
⅝,	" 19 and 20.....	.55 "
⅝,	" 21.....	.65 "
⅝,	" 22.....	.75 "
⅝,	" 23.....	.85 "
9-16,	" 13, 14 and 15.....	.45 "
9-16,	" 16, 17 and 18.....	.50 "
9-16,	" 19 and 20.....	.60 "
9-16,	" 21.....	.70 "
9-16,	" 22.....	.80 "
9-16,	" 23.....	.90 "
⅝,	" 13, 14 and 15.....	.55 "
⅝,	" 16, 17 and 18.....	.60 "
⅝,	" 19 and 20.....	.70 "
⅝,	" 21.....	.80 "
⅝,	" 22.....	.90 "
⅝,	" 23.....	1.00 "
7-16,	" 13, 14 and 15.....	.80 "
7-16,	" 16, 17 and 18.....	.90 "
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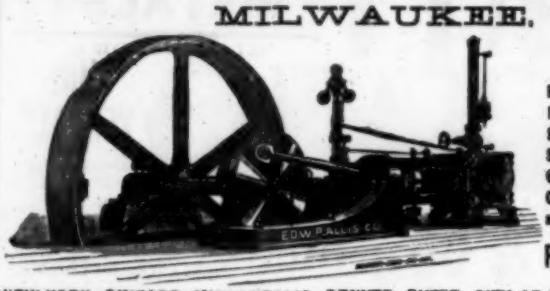

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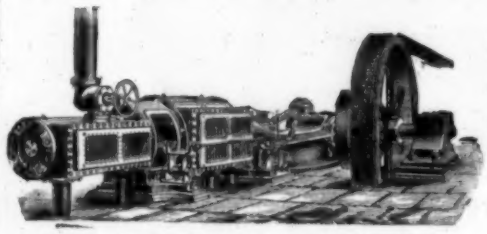

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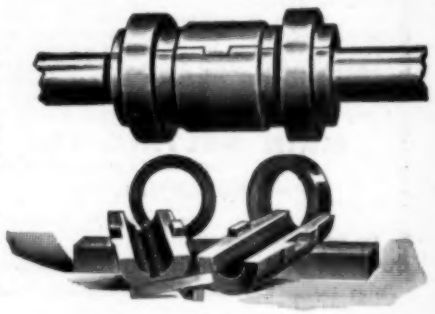

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Bourne-Fuller Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ills.
American Steel Hoop Co., Pittsburg, Pa.

BEARING METAL—
Magnolia Metal Co., New York City.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips Sons' Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

BELTING—
C. H. Besly & Co., Chicago, Ill.
The Chicago Rawhide Mfg. Co., Chicago, Ill.
The Gandy Belting Co., Baltimore Md.
Main Belting Co., Philadelphia, Pa.

BELT LACING—
The Bristol Co., Waterbury, Conn.

BLACKSMITH AND CARRIAGE SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

BLAST FURNACE MACHINERY—
Excelsior Iron Works Co., Cleveland, O.

BLAST FURNACE WORK—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.

BLOWING ENGINES—
Southwark Foundry & Machine Co., Philadelphia, Pa.
Edward P. Allis Co., Milwaukee, Wis.

BOILERS AND BOILER ATTACHMENTS—
The Wm. B. Pollock Co., Youngstown, O.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
Hooven, Owens & Rentschler Co., Hamilton, O.
Harrison Safety Boiler Works, Philadelphia.
Meehan Boiler & ConstructionCo., Lowellville, O
Wm. Cramp & Sons, Philadelphia, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Excelsior Iron Works Co., Cleveland, O.
James Bonar & Co., Pittsburgh, Pa.
W. P. Davis Machine Co., Rochester, N. Y.

BOILER CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

BOILER COVERING—
C. H. Besly & Co., Chicago, Ill.

BOILER COMPOUNDS—
The Ironsides Company, Columbus, O.

BOILER FRONTS AND FITTINGS—
Playford Stoker Co., Cleveland, O.

BOILER TUBES—
S. Fix Sons, Cleveland, O.
National Tube Co., Pittsburg, Pa.

BOILER TUBE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa

BOLTS AND NUTS—
Upson Nut Co. Cleveland, O.

I. & R. Greenwald Co., Cincinnati, O.
Webster Camp & Lane Machine Co., Akron, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Baush & Harris Machine Tool Co., Springfield, Mass.
Bickford Drill and Tool Co., Cincinnati, O.

BRASS CASTINGS—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

BRIDGES—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Shiffler Bridge Co., Pittsburg.

BUILDINGS (STEEL FRAME)—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

BUCKETS AND DERRICKS—
Excelsior Iron Works Co., Cleveland, O.

CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

CAR UNLOADERS—
Excelsior Iron Works Co., Cleveland, O.

CARRYING TONGS—
Vulcan Mfg. Co., Pittsburg, Pa.

CASE HARDENING MATERIALS—
American Carburizing Co., New York City.

CASTINGS—
Seaman-Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
Macbeth & Co., Cleveland, O.
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Lorain Foundry Co., Lorain, O.
Bethlehem Steel Co., South Bethlehem, Pa.

CASTINGS (ALUMINUM)
J. J. Ryan & Co., Chicago, Ill.

CASTINGS (BRASS)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co Lorain, O.

CASTINGS (BRONZE)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

CASTINGS (MALLEABLE)—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.

CEMENT—
The Brier Hill Iron & Coal Co., Youngstown, O.
Garden City Sand Co., Chicago, Ill.
Reed F. Blair & Co., Pittsburg, Pa.

CHAIN HOISTS—
Reading Crane & Hoist Works, Reading, Pa.

CHAIN BELTING—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
Buhl Malleable Co., Detroit, Mich.

CHANNELERS—
The Ingersoll-Sergeant Drill Co., New York.

CHEMISTS—
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
The R. W. Hunt & Co., Chicago, Ill.
John T. Jones & Co., Chicago, Ill.
Cremer & Bicknell, Cleveland, O.
We Fu Go Co., Cincinnati, O.

CHILLED AND SAND ROLLS—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Riverside Foundry Co., Cleveland, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips Sons' Co., Philadelphia, Pa.
Lorain Foundry Co., Lorain, O.

CHUCKS—
Skinner Chuck Co., New Britain, Conn.

COAL CUTTERS—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.

COAL SCREENS—
Rob't. Aitchinson Per. Metal Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

COAL AND COKE—
Matthew Addy & Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O
Reed F. Blair & Co., Pittsburg, Pa.
Forster, Waterbury & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Washington Coal and Coke Co., Pittsburg, Pa.
Pickands, Mather & Co., Cleveland, O.

COAL MINING MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
Webster Camp & Lane Machine Co., Akron, O.

CONVEYORS—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.

COMPAROMETERS—
Vulcan Mfg. Co., Pittsburg, Pa.

COMPRESSED AIR SHOP TOOLS—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Q & C Co., Chicago, Ill.
American Pneumatic Tool Co., New York City.
Manning, Maxwell & Moore, New York City.

COMPRESSION COUPLINGS—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

CONTRACTORS FOR CLEANING BOILERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

CORE OVENS—
Millett Core Oven Co., Brightwood, Mass.

CORRUGATED IRON—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Cincinnati Corrugating Co., Piqua, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

COTTON TIES—
American Steel Hoop Co., Pittsburg, Pa.

CRANES AND DERRICKS—
Northern Engineering Works, Detroit, Mich.
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
Reading Crane & Hoist Works, Reading, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
Excelsior Iron Works Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Crane & Car Co., Cleveland, O.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa
Northern Engineering Works, Detroit, Mich.

DIES—
Danielson Machine & Tool Co., Cleveland, O.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

DRILL GRINDERS—
J. Wendell Cole Columbus, O.

DRILL PRESSES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Manning, Maxwell & Moore, New York City.
Danielson Machine & Tool Co., Cleveland, O.

DROP FORGINGS—
Wyman & Gordon, Worcester, Mass.
Chicago Drop Forge & Foundry Co., Kensington, Ill.

DROP PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
R. Konigslow & Bro., Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield, Mass.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELEVATING AND CONVEYING MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O
Buhl Malleable Co., Detroit, Mich.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

EMERY AND CORUNDUM WHEELS—
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besley & Co., Chicago, Ill.
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

EMERY WHEEL MACHINERY—
J. Wendell Cole, M.E., Columbus, O., or Chicago
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

ENGINEERS AND CONTRACTORS—
Wellman-Seaver Engineering Co., Cleveland, O.
Walter Kennedy, Pittsburg, Pa.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O
E. K. Erickson, Pittsburg, Pa.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
American Tool Works Co., Cincinnati, O.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES, STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill

FILTERS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt.Savage, Md.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
A. F. Smith & Co., New Brighton, Pa.
Chas. Taylor's Sons Co. Cincinnati, O.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Bræburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg, Pa.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W.Va.
Excelsior Iron Works Co., Cleveland, O.
Macbeth & Co., Cleveland, O.

FOUNDRY EQUIPMENT.
Miller & Hays, Akron, O.
Tabor Mfg. Co., Elizabeth, N. J.
Millett Core Oven Co., Brightwood, Mass.
Brass Founders Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Cleveland Crane & Car Co., Cleveland, O.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Chas. Taylor's Sons Co., Cincinnati, O.
Miller & Hays, Akron, O.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co, Cleveland, O.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

FRICTION METAL—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Magnolia Metal Co., New York City.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago. Ill.

FURNACES—
Playford Stoker Co., Cleveland, O.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GREASE—
A. F. Boettcher, Rowlands, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Q & C Co., Chicago, Ill.

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HOISTS—
Reading Crane & Hoist Works, Reading, Pa.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

HOISTING ENGINES—
The Edward P Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O

HOISTING MACHINERY—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co. Columbus, O.
Excelsior Iron Works Co., Cleveland, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

HOTELS—
United States Hotel Co., Cleveland, O.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

IRON BUILDINGS—
Schiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & SteelCo., Bridgeport, O.
Cincinnati Corrugating Co., Piqua, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON WORKING TOOLS—
American Tool Works Co., Cincinnati, O.
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Ball & Screw Co., Cleveland, O.
W. P. Davis Machine Co., Rochester, N. Y.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LADLES—
Northern Engineering Works, Detroit, Mich.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

LUBRICATORS—
A. F. Boettcher, Rowlands, Pa.

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.
Forster, Waterbury & Co., Chicago, Ill.

MANUFACTURING CHEMISTS—
We Fu Go Co., Cincinnati, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Magnolia Metal Co., New York City.
Swarts Metal Refining Co., Chicago, Ills.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis,
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

ORE CARS—
The Pressed Steel Co. Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Co, Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Seibel-Suesdorf Copyer & Iron Mfg. Co., St. Louis, Mo.
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
C. Wilford Peters, Cincinnati, O.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland, O.

PERFORATED METALS—
Seibel-Suessdorf Copper & Iron Mfg. Co., St. Louis, Mo.
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.

PIG IRON—
Matthew Addy & Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,

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G. H. Ginther, Special Agent, Pittsburg, Pa.

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Wm. B. Scaife & Sons, Pittsburg, Pa.

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Union Boiler Tube Cleaner Co., Pittsburg, Pa.

PIPE COVERING—
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Jenkins Bros., New York City

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chcago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.

PNEUMATIC TOOLS—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago, Ill.

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Vulcan Mfg. Co., Pittsburg, Pa.

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E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

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E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

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E. A. Delano, Chicago, Ill.
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Garden City Sand Co., Chicago, Ill.

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Jonse & Laughlins, Ltd., Pittsburg, Pa.

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The Ingersoll-Sergeant Drill Co., New York.

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Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

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Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
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Fraser & Chalmers, Chicago, Ill.

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Fitzsimmons & Co., Cleveland, O.
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Riter-Conley Mfg. Co., Pittsburg, Pa.
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Northern Engineering Wotks, Detroit, Mich.
Miller & Hays, Akron, O.

TRUCKS—
Northern Engineering Works, Detroit, Mich.

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National Tube Co., Pittsburg, Pa.
S. Fix' Sons, Cleveland, O.

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Union Boiler Tube Cleaner Co., Pittsburg, Pa.

TUBE WELDING—
S. Fix Sons, Cleveland, O.

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Northern Engineering Works, Detroit, Mich.

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Republic Iron & Steel Co, Chicago, Ill.
Cleveland City Forge & Iron Co., Cleveland, O

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TWIST DRILL CASES—
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WIRE NAILS—
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Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Acme Malleable Iron Works	2
Addy & Co., Matthew	1-22
Ætna-Standard Iron & Steel Co	30
Ætna Fire Brick Co	33
Aitchison, Rob't, Perforated Metal Co	32
Allis & Co., Edward P	42
American Carburizing Co	25
*American Pneumatic Tool Co	—
American Steel Hoop Co	38
American Steel & Wire Co	37
American Tin Plate Company	39
American Tool Works Co	26
Apollo Iron & Steel Co	1
Armstrong Bros. Tool Co	1
Armstrong Mfg. Co	29
Aultman Co	2
Austin Separator Co	47
Baird Machinery Co., U	24
Baush & Harris Machine Tool Co	48
*Berger Mfg. Co	32
*Bertsch & Co	30
Besly & Co., Chas. H	48
Bethlehem Steel Co	47
*Bickford Drill & Tool Co	—
Bickford, H	48
Blair & Co., Reed P	2
Blakeslee Mfg. Co	1
Boettcher, A. F	34
Bonar & Co., James	28
Bourne-Fuller Co	1-2
Bræburn Steel Co	35
Brass Founders' Supply Co	33
Brier Hill Iron & Coal Co	24
Bristol Co., The	1
*Brown, Edward	32
Brown Hoisting and Conveying Machine Co	31
Bucyrus Co	25
Buhl Malleable Co	23
Cahall Sales Department	1
Central Electrotype & Engraving Co	42
*Champion Rivet Co	—
Chicago Drop Forge & Foundry Co	1
Chicago Fire Clay Product Co	33
Chicago Press Clipping Bureau	40
*Chicago Rawhide Mfg. Co	—
Chicago Screw Co	1
Cincinnati Corrugating Co	1
Clayton Air Compressor Works	2
Clearfield Fire Brick Co	33
Cleveland Ball & Screw Co	29
Cleveland City Forge & Iron Co	1
Cleveland Crane & Car Co	31
†Cleveland Facing Mill Co	—
Cleveland & Buffalo Transit Co	33
Clinton Iron & Steel Co	30
Cole, J. Wendell	48
Covert Mfg. Co	29
Cramp & Sons, Wm	47
Cremer & Bicknell	32
Crescent Steel Co	35
Danielson Machine & Tool Co	48
Davis Machine Co., W. P	29
Denison, Prior & Co	24
Delano, E. A	30
Detroit & Cleveland Navigation Co	38
Dixon Jos., Crucible Co	32
*Dodge Mfg Co	—
Dover Fire Brick Co	33
Drake, Bartow & Co	30
Emmerton, F. A	2
Enterprise Boiler Co	1
Erikson, Edward E	24
Excelsior Iron Works Co	31
Fitzsimons & Co	35
*Fix Sons	—
Fleharty, J. H. & Co	47
Forster, Waterbury & Co	1
Fraser & Chalmers	34
Frick Coke Co., H. C	1
Gandy Belting Co	48
Garden City Sand Co	33
Gerlach, Peter & Co	35
Ginther, G. H	25
Gobeille Pattern Co	35
Goodyear, S. W	29
Greenwald Co., I. & E	28
Hall Steam Pump Co	34
Hanna & Co., M. A	30
Harrison Safety Boiler Works	21
Hartford Steam Boiler Insp. & Ins. Co	35
Heyl & Patterson	34
†Hickman, Williams & Co	—
Holmes, Strachan & Co	33
Hooven, Owens & Rentschler Co	28
Hunt Robt. W., & Co	2
Illinois Central R. R	40
Ingersoll-Sergeant Drill Co	2
Iron Clad Paint Co	29
Ironsides Co	23
Jeffrey Mfg. Co	31
Jenkins Bros	32
Jones & Co., John T	2
Jones Foundry & Machine Co., W. A	1
Jones & Laughlins, Ltd	39
Kennedy, Walter	32
Kentucky Fire Brick Works	24
Konigslow & Bro., E	29
La Belle Steel Co	35
Lake Superior Consolidated Iron Mines	30
Laughlin & Co., Alex	32
Lidgerwood Mfg Co	31
Link-Belt Machinery Co	31
Lorain Foundry Co	46
Lorain Steel Co	39
Macbeth & Co	24
Magnolia Metal Co	2
Mason, Samuel R	29
Main Belting Co	32
Manning, Maxwell & Moore	26
Marion Steam Shovel Co	48
McKeefrey & Co	30
Meehan Boiler & Construction Co	48
Merchant & Co	41
Miller & Hays	25
Millett Core Oven Co	2-33
Monongahela Iron & Steel Co	35
Morris & Bailey Steel Co	35
National Engraving Co	25
National Tube Co	36
‡Newport Sand Bank Co	—
Northampton Emery Wheel Co	41
Northern Engineering Co	31
Nuttall Co. The R. D	28
Oak Hill Fire Brick & Coal Co	24
Oglebay, Norton & Co	30
†Ohio Sand Co	—
Ohio Steel Co	30
Otis Steel Co	23
†Parkhurst & Wilkinson Co	—
Perfect Lubricating Metal Co	48
Peter C. Wilford	36
Phillips' Sons Co., P. R	1-46
Phœnix Horse Shoe Co	24
Pickands, Mather & Co	30
Playford Stoker Co	30
Pollock, The Wm. B. Co	2
Prescott Steam Pump Co	34
Pressed Steel Car Co., The	38
Q & C Co	22
Rand Drill Co	2
Reading Crane & Hoist Works	31
Republic Iron & Steel Co	38
Riter-Conley Mfg. Co	32
Riverside Foundry Co	23
Rogers, Brown & Co	1-21
*Rockwell & Co., W. S	1-27
Ryan, J. J. & Co	42
Scaife & Sons, Wm. B	47
Seaman, Sleeth Co	45
Seibel Suessdorf Copper & Iron Mfg. Co	3
Sennett Co., Geo. B	42
Scioto Star Fire Brick Works	33
‖Sharon Fire Brick Works	1
Shiffler Bridge Co	32
Skinner Chuck Co	29
Smith & Co. A. F	33
Southwark Foundry and Machine Co	42
Spearman Iron Co	48
Star Corundum Wheel Co	33
Stevens, F. B	46
Streeter, H. A	2
Stroud & Co., E. H	2
*Superior Charcoal Iron Co	—
Swarts Metal Refining Co	1
Tabor Mfg Co	33
Taylor's Sons Co., Chas	24
Textor, O	2
Tod, Wm. & Co	42
Totten & Hogg Iron & Steel Foundry Co	46
Trethewey & Co., Ltd., Samuel	35
Union Mining Co	23
Union Boiler Tube Cleaner Co	1
United States Hotel Co	35
Upson Nut Co	1
Van Dorn & Dutton Co	28
Vermillion Pine & Iron Land Co	48
Vulcan Mfg. Co	32
Washington Coal and Coke Co	34
Webster, Camp & Lane Machine Co	27
Webster Fire Brick Co	4
Wellman-Seaver Engineering Co	31
We Fu Go Co	32
Wheeling Mold & Foundry Co	41
White, Byron H	38
Wyman & Gordon	45

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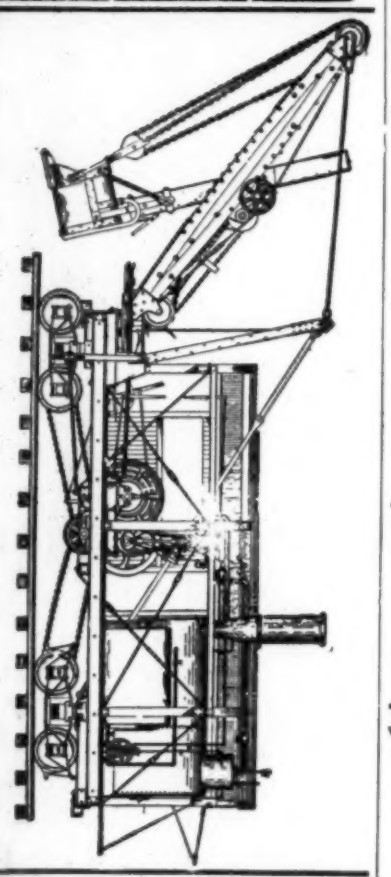

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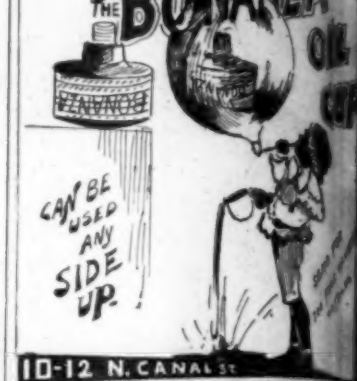

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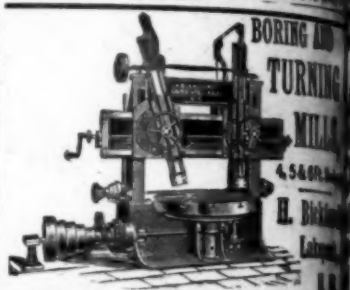

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